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GREAT LAKES WATER QUALITY - ANNUAL REPORT 1972

International Joint Commission-United States
and Canada

April 1973

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This is the first Annual Report of the Great Lakes Water Quality Board to the International Joint Commission pursuant to the Great Lakes Water Quality Agreement between the United States and Canada signed on April 15, 1972.

This report is intended to present a current assessment of water quality in the boundary waters of the Great Lakes and of the control programs and other measures set forth in the Agreement.

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GREAT LAKES WATER QUALITY
ANNUAL REPORT

TO THE
INTERNATIONAL JOINT COMMISSION

GREAT LAKES WATER QUALITY BOARD
APRIL 1973

ia

INTERNATIONAL GREAT LAKES
WATER QUALITY BOARD

April 1973

International Joint Commission
Canada and United States

Gentlemen:

The International Great Lakes Water Quality Board, as a requirement of the Water Quality Agreement of 1972, is submitting the following Annual Report on Great Lakes Water Quality prepared by the Board.

Respectfully submitted,

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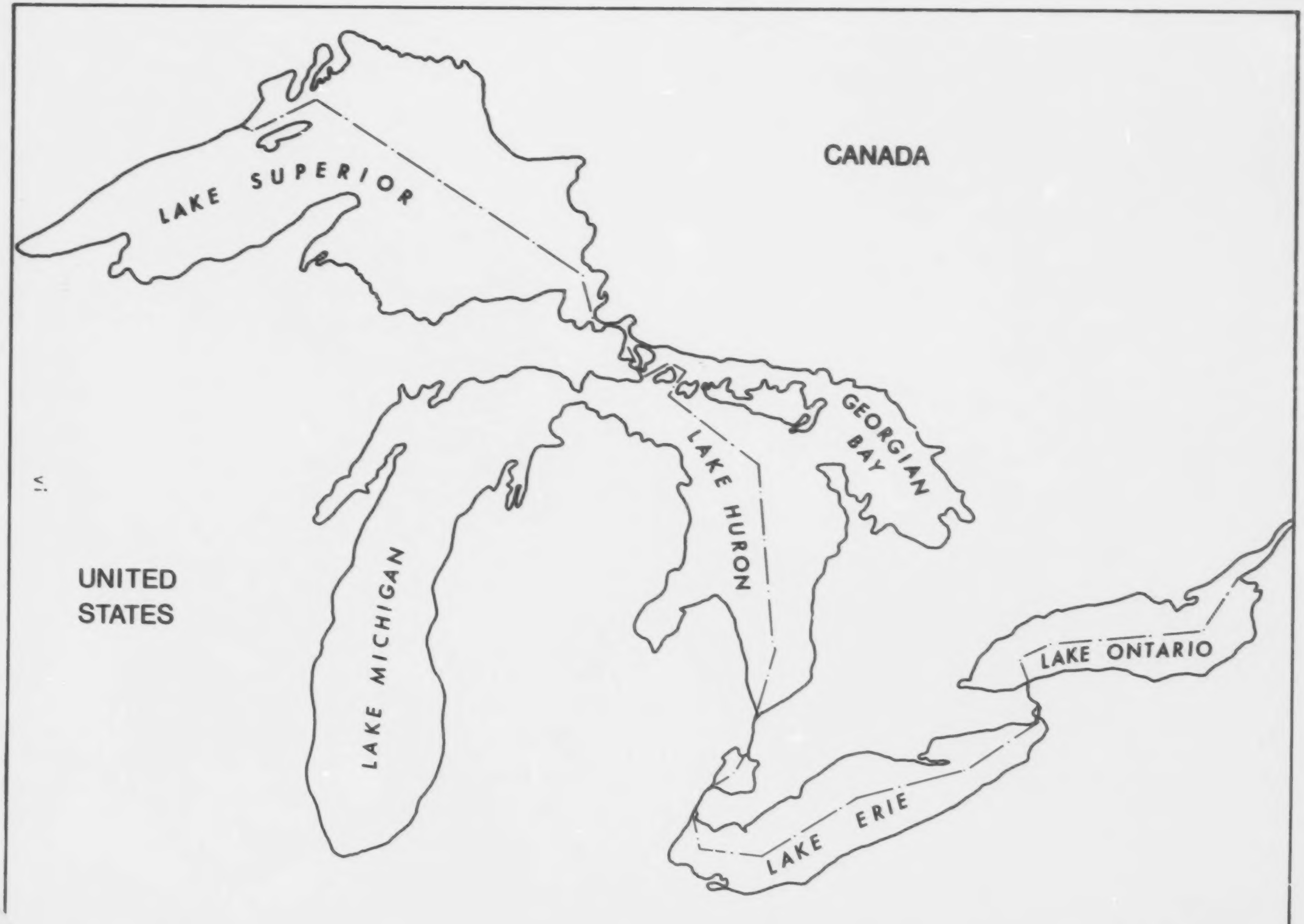
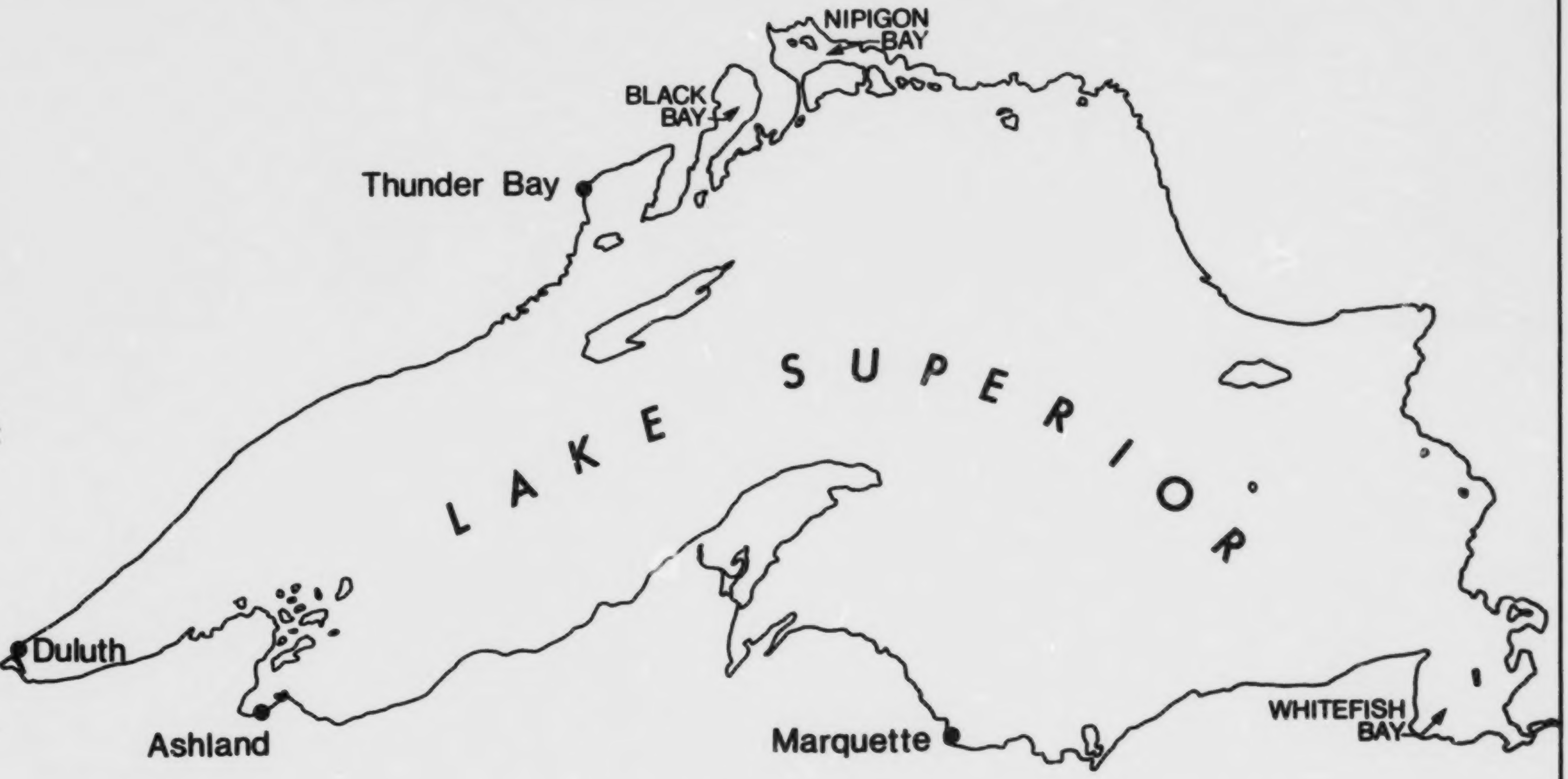

LAKE SUPERIOR
CANADA
GEORGIAN BAY
LAKE HURON
LAKE MICHIGAN
UNITED STATES
LAKE ONTARIO
LAKE ERIE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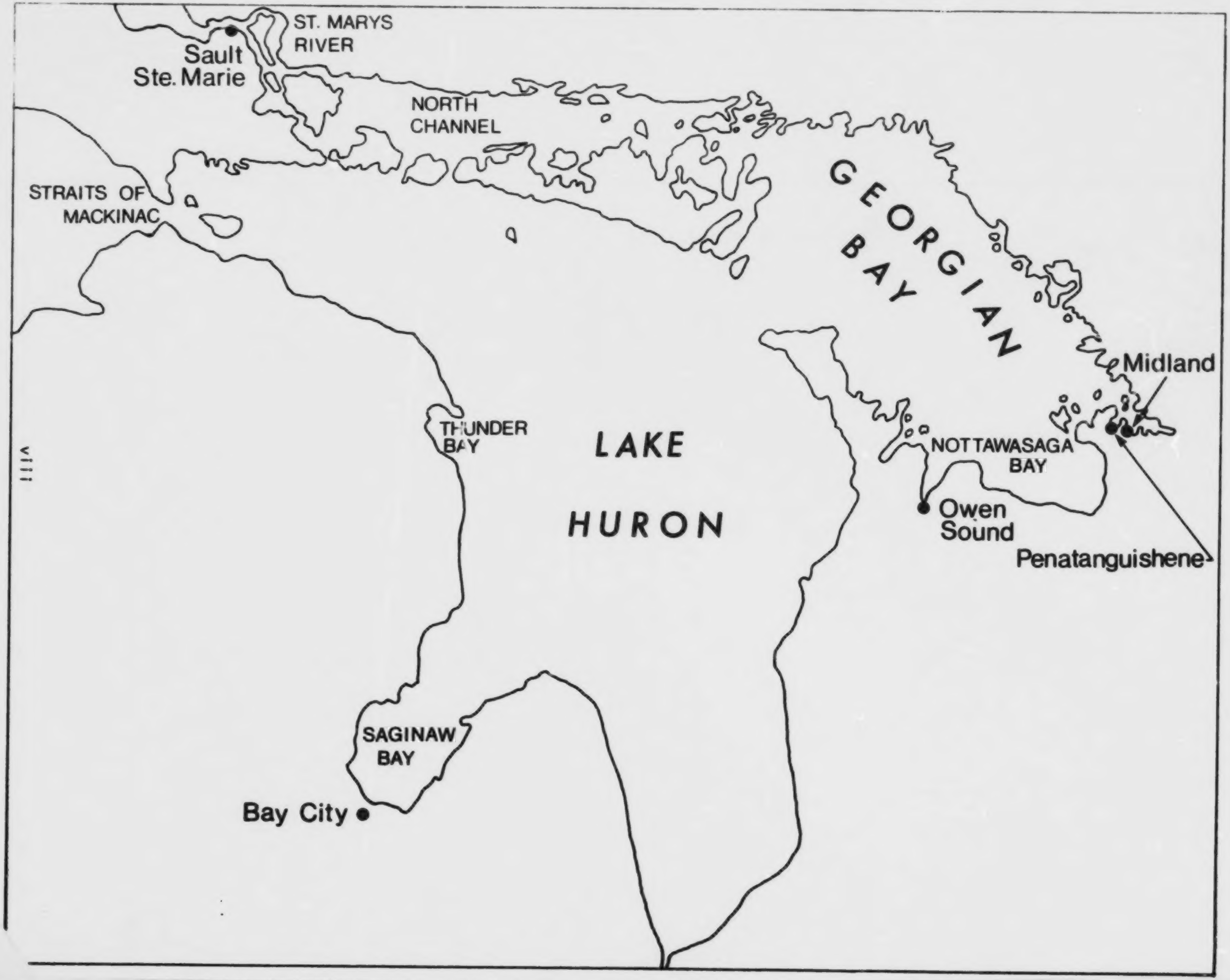
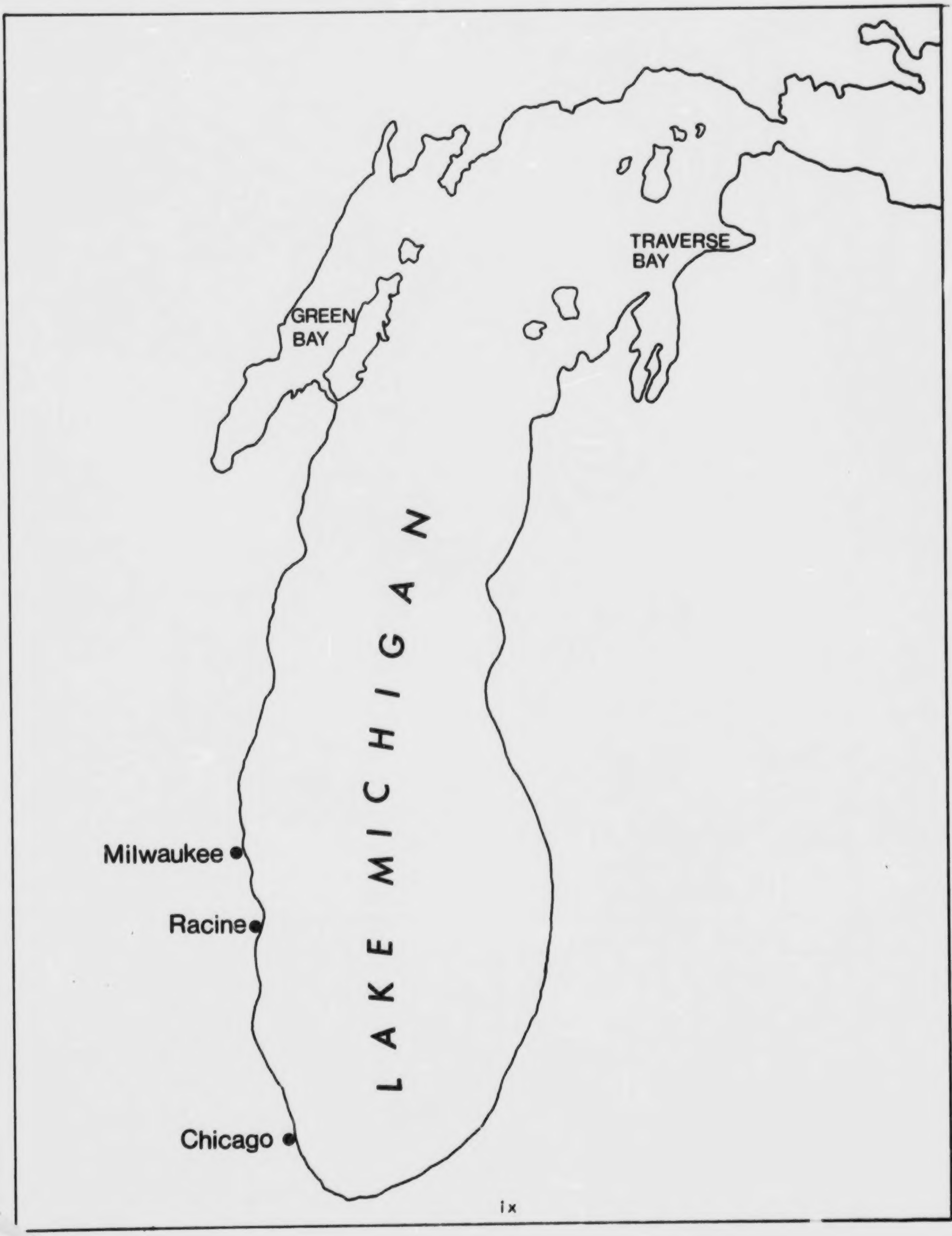
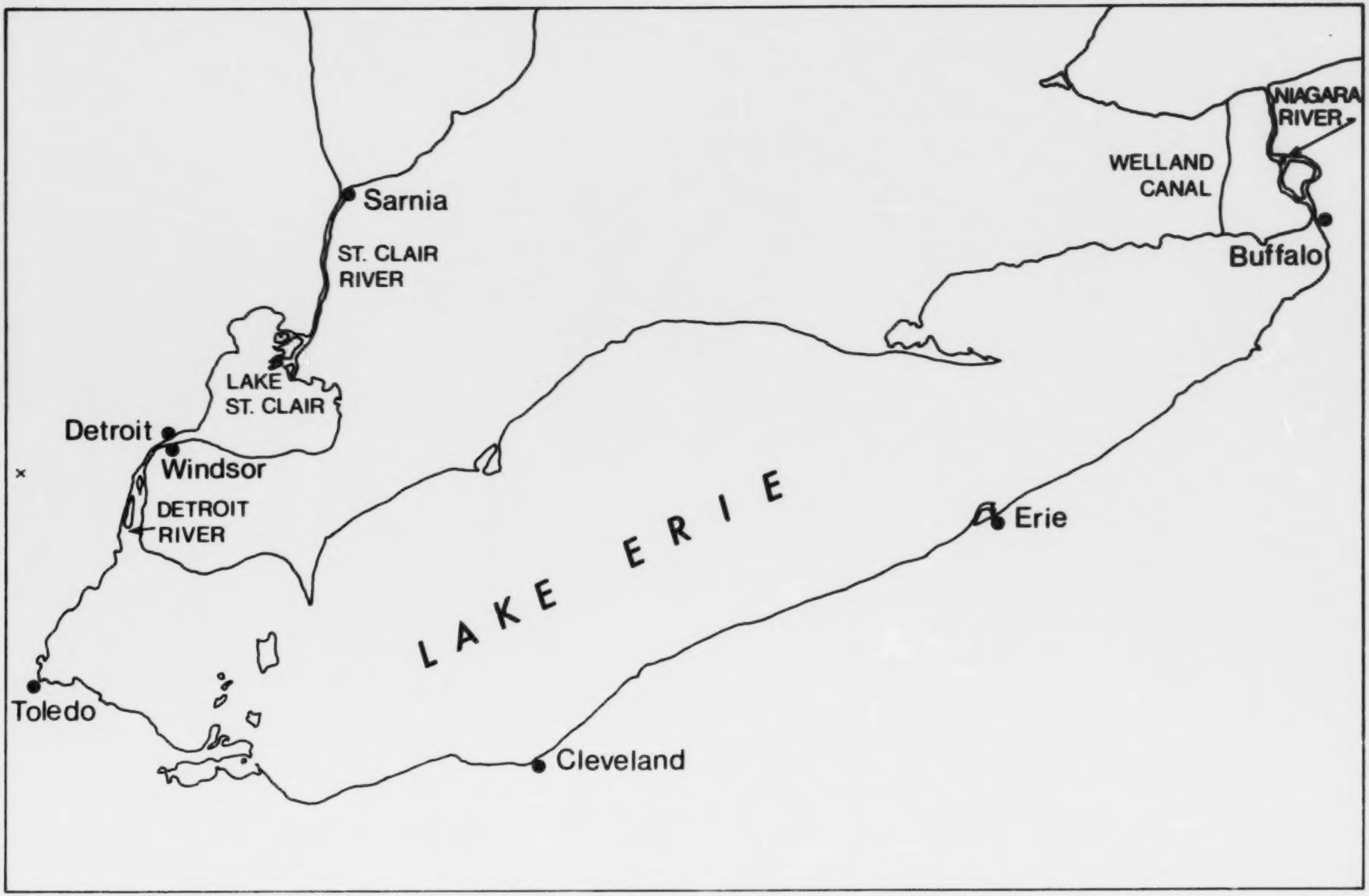
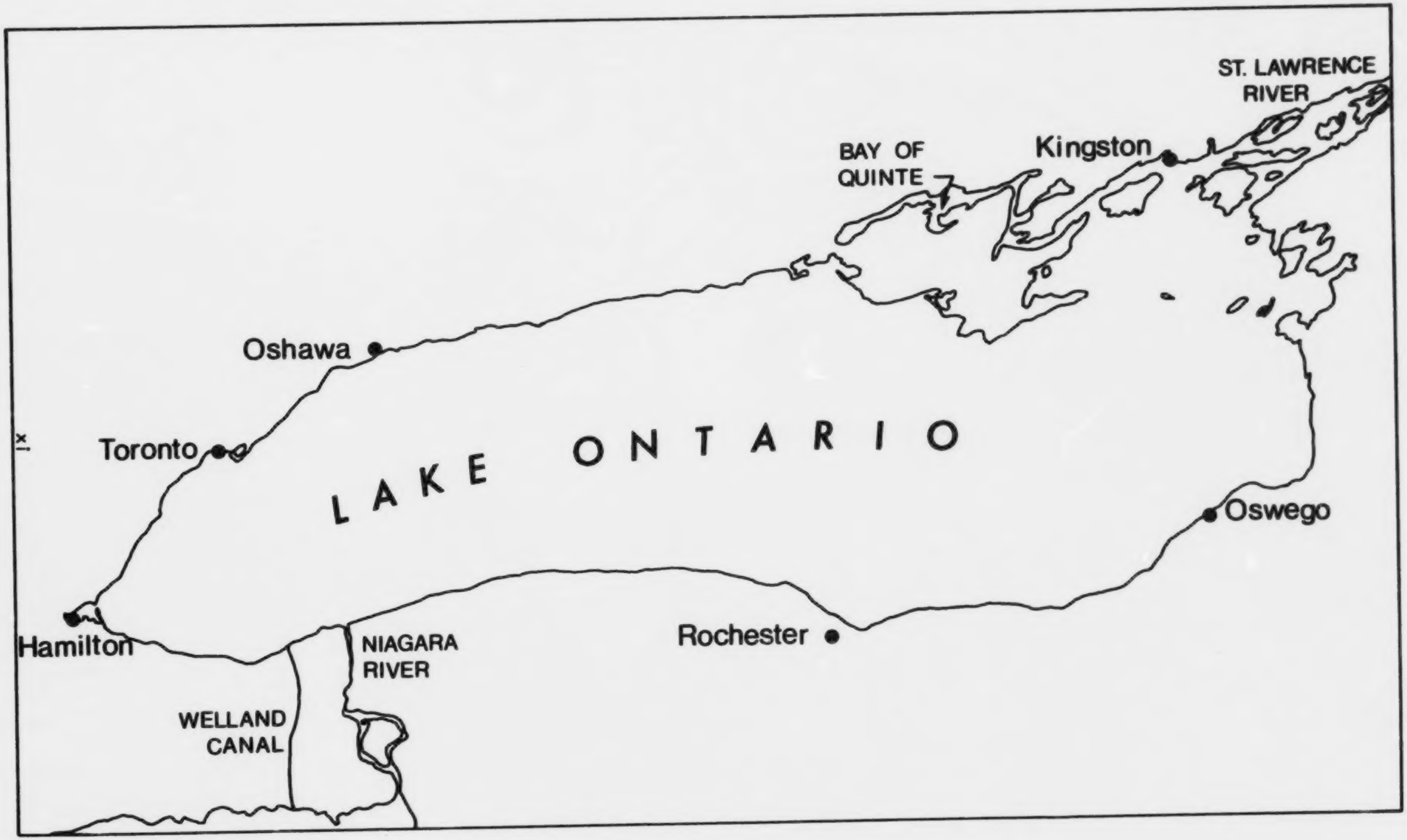
BLACK BAY
Thunder Bay
LAKE SUPERIOR
Duluth
Ashland
Marquette
WHITEFISH BAY


ST. MARYS RIVER
Sault Ste. Marie
NORTH CHANNEL
STRAITS OF MACKINAC
GEORGIAN BAY
Midland
NOTTAWASAGA BAY
Owen Sound
Penatanguishene
THUNDER BAY
LAKE HURON
SAGINAW BAY
Bay City


GREEN BAY
TRAVERSE BAY
LAKE MICHIGAN
Milwaukee
Racine
Chicago


Sarnia
ST. CLAIR RIVER
LAKE ST. CLAIR
Detroit
Windsor
DETROIT RIVER
Toledo
LAKE ERIE
Cleveland
Erie
WELLAND CANAL
NIAGARA RIVER
Buffalo


ST. LAWRENCE RIVER
BAY OF QUINTE
Kingston
Oshawa
Toronto
LAKE ONTARIO
Oswego
Hamilton
Rochester
NIAGARA RIVER
WELLAND CANAL

Chapter I

SUMMARY AND RECOMMENDATIONS

I - SUMMARY & RECOMMENDATIONS

1. PROGRESS TOWARDS ACHIEVEMENT OF WATER QUALITY OBJECTIVES

Water Quality Conditions and Problems

The Great Lakes Water Quality Board concludes on the basis of the water quality data and other information available to it that a great variety of water quality conditions and problems exist in the boundary waters of the Great Lakes from Lake Superior downstream through the intensely developed lower lakes and extending into the St. Lawrence River. These conditions reflect variations in the type and intensity of use of water, land and other related resources.

The Board considers Lake Superior to be of high quality with impairment limited generally to localized areas where waste discharges are introduced to the lake or its embayments. A notable exception to this is the mining industry operation at Silver Bay, Minnesota, where large quantities of suspended solids, containing a variety of mineral substances, are discharged into the lake.

Generally the quality of Lake Michigan water is considered to be very good in the open waters and at the Straits of Mackinac entrance to Lake Huron where all objectives are met. In the mid to southern areas of the lake, the biomagnification of DDT and PCB's in salmon, trout and certain other species of fish has prevented commercial sales. Waste discharges along the populated and industrialized shoreline cause localized water quality degradation with phosphorus, chlorides, PCB's and possibly certain heavy metals impacting on lake water quality.

Evidence of impairment of Lake Huron and Georgian Bay is generally restricted to the vicinity of waste sources, nutrient laden tributaries and embayments where water circulation is limited, or to areas where development is more intensive. Examples of where these conditions may be found include Saginaw Bay and the south-eastern corner of Georgian Bay. In addition, the Saginaw River was determined to be a major source of PCB's to the Saginaw Bay of Lake Huron.

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The anoxic conditions in the hypolimnion of the central basin of Lake Erie recurred in 1972. While these conditions were observed in August in the central basin, low values for oxygen were also reported in both the western and eastern basins - conditions which had been also encountered in the summer of 1971. Only as greater reductions in nutrients and other pollutant loadings are made in the coming years can improvements be anticipated in the water quality of Lake Erie.

The Niagara River is the route whereby much of the phosphorus and total dissolved solids enter Lake Ontario. The evidence of water quality impairment in Lake Ontario is mainly confined to the near-shore waters. Nutrient control programs are in progress, however improvements to faulty sewage collection systems are a number of years away. Notable locations where these problems continue are in the Toronto - Hamilton - St. Catherines and Rochester areas.

Waste discharges into the connecting channels of the Great Lakes from industrial sources continue to impair water quality. These cause intermittent problems with floating oils and scum, discoloration, solids, and lingering localized pollution from phenols, bacteria and other pollutants. Locations of continuing concern include the St. Marys River downstream from the pulp and steel mills at Sault Ste. Marie, Ontario, the St. Clair and Detroit Rivers downstream from the large population and heavily industrialized centres along these rivers, notably the City of Detroit and the extensive industrial complex in the Sarnia area. Similar problems occur in the Niagara River in the heavily industralized Buffalo-Niagara Falls area. Despite the success in reducing mercury inputs, its presence persists in various species of fish in the Lower Lakes System.

Water Quality Programs

In considering the data collection efforts of the federal, state and provincial governments in both deep water and near-shore monitoring and surveillance programs, the Board concludes that insufficient resources are committed to permit consistent and meaningful reviews of progress in achieving the water quality objectives of the Agreement. Significant variations occur in surveillance program coverage, methods of sampling, analysis and reporting of data, including problems with parameter selection, frequency, spatial coverage and sample type. Measured parameters and units, including quantities of phosphorus, heat and other physical and chemical characteristics and variations should provide a uniform and consistent data set for future descriptions of waste loadings and water quality to facilitate comparisons and measures of progress.

Legislative Measures Affecting Programs

The Board has noted the legislative changes which occurred in both countries during 1972 which will have far-reaching effects on attainment of the timing provisions of the Agreement in both countries.

In Canada, the second year of the Canada-Ontario Agreement was concluded with a record capital expenditure devoted to improving sewage works construction. The agreed program is proceeding on a schedule designed to achieve completion of the required works to meet the targets of the Great Lakes Water Quality Agreement. Further, a new program in Ontario will provide greater financial assistance to local communities, where the financial burden for provision of needed water and sewage service is heaviest. New regulations under the Canada Water Act further reduced the phosphorus content of fabric laundry detergents to 5% P_2O_5 as of January 1, 1973. This phosphorus control program is supported by a nationwide monitoring program to evaluate the impact of substitute detergent builders.

In the United States, the 1972 amendments to the Federal Water Pollution Control Act authorized record levels of federal spending and cost sharing for municipal sewage works construction, extension of project eligibilities for financial support, new requirements for implementation, industrial sewer use, pretreatment requirements, deadlines for technology goals and establishment of a National Pollutant Discharge Elimination System Permit Program (NPDES).

Although record funds were authorized in the 1972 Amendments and appropriations were increased over FY 1972, the release of 2/5 and 1/2 of the funds authorized for FY 1973 and 1974 respectively, spiraling costs and the enlarged scope of projects eligible for funding will greatly impair the ability of the states to implement the Agreement in needed municipal works construction.

Appropriations less than authorized for state programs further restrict the ability of the states to carry out expanded programs.

The first phase of the municipal pollution control program in the United States consists of secondary treatment, phosphorus reduction and effluent disinfection, as a minimum. At the completion of this first phase, the major source of raw sewage will be overflows from combined storm and sanitary sewers. Without a firm assessment of the location, magnitude and timing of where these conditions exist and specific plans for their correction, this problem will continue to hinder the overall effectiveness of the many other efforts to control point sources of pollution.

Control of Industrial Sources of Pollution

The Board notes that industrial pollution control is progressing. However, a number of regulatory orders, actions and proceedings have had to be invoked to assure completion of projects over the next three years. It is noted that delays in correction of notable industrial sources of pollution along the Niagara River in New York resulted in most cases from delays in initiation of municipal projects with which they are associated.

The Board views with continued concern the need for maintenance by the governments of warnings of non-consumption of fish contaminated by mercury and urges the undertaking of the necessary additional surveillance work required to isolate remaining sources of mercury and other toxic substances, including heavy metals and persistent organic chemicals.

In considering possible pollution from thermal and radioactive material discharges, the Board concludes that considerable effort must be dedicated to determining the environmental impact and health hazards of these types of discharges including the development of effluent requirements needed to achieve the water quality objectives.

Control of Eutrophication

The Board notes that nutrient loading is being reduced by regulations on detergent phosphorus in Canada and in the states of New York, Michigan, and Indiana. Elsewhere local regulations are in effect.

Phosphorus control programs in the Lower Lakes Basin appear to be adequate to meet the reduction in loadings which are in the Agreement. Detergent reformulation may be impacting the reductions to a greater extent than was contemplated. Phosphorus control programs are also being implemented in the upper lakes, including Lake Michigan. A critical review of reporting data and methods of calculating the loads and reduction in load to the system should be undertaken to determine if the data are sufficient in terms of frequency, accuracy and representative of loads for given time periods.

Control of Pest Control Products

The Board notes that recent legislative enactments in both countries have strengthened governmental programs for classification, registration, use, disposal and enforcement concerning pest control products. These programs will have a favorable impact on water quality and associated aquatic life.

Control of Pollution from Animal Husbandry

The Board notes that state and provincial governments employ programs directed towards reduction of nutrients, sediments and other pollutants from animal barnyards, feedlots and holding areas. These programs generally depend upon the cooperation of farmers and others and include financial and technical assistance in application of technology for pollution control.

Disposal of Solid and Liquid Wastes

The Board concludes that governmental programs for controlling the disposal of solid and hauled liquid wastes are in various stages of development. When these programs are fully implemented they will have a favorable impact on water quality and should be consistent with the objectives of the Agreement.

Nutrients and Sediments

The Board concludes that control of erosion and polluting urban, rural and agricultural runoff is required if the objectives of the Agreement are to be met. Several jurisdictions employ guidelines for industrial and commercial development and use of land relating to landfilling and other construction and maintenance. These problems will be resolved by controlling land use practice as contrasted to point source treatment. The Land Drainage

Reference Group will investigate these problems as they relate to water quality and propose corrective action programs.

Pollution from Shipping Activities

- Control of Vessel Wastes

The Board notes that federal vessel waste regulations expected to be promulgated in 1973 in the United States provide for correction of pollution from new vessels by 1975, and from existing vessels by 1978. In the interim, state regulations apply. In addition to conflicting with state regulations prohibiting discharges, there is uncertainty whether the treated effluents from existing vessels to be permitted by the regulations will comply with the water quality objectives of the Agreement. Further, the prohibiting of such discharges by the states under the new federal law is contingent on the availability of shore reception facilities.

The Board also notes that similar regulations including devices for recirculation or evaporation are under consideration in Canada. In order to avoid undue delay in control of vessel sewage discharges, the Province of Ontario has proposed an accelerated program for the provision of shore reception facilities at Canadian ports on the Great Lakes for the removal of wastes from existing commercial vessels.

2. RECOMMENDATIONS

The Great Lakes Water Quality Board recommends:

(1) that the IJC Great Lakes Regional Office at Windsor be adequately staffed immediately.

(2) a. that the Government of Canada and the Province of Ontario conclude satisfactory arrangements to assure effective cash flow financing of municipal sewage works construction in municipalities in the Upper Great Lakes Basin.

b. that the Government of the United States increase its funding for construction of municipal sewage works in accord with funding levels, authorized and appropriated by congress, in the Federal Water Pollution Control Amendments of 1972 in order to assure the achievement of established standards.

c. that the Governments in the Great Lakes Basin consider the abatement of pollution sources discharged to the Great Lakes Basin of high priority.

(3) that the Commission urge the Federal, State and Provincial Governments, in concert with the IJC to develop and make firm commitments including program grant funding to perform an IJC directed monitoring program which will provide a uniform and consistant data set for future descriptions of water quality as required under the Agreement.

(4) that the Parties to the Agreement be requested to include the State and Provincial Governments in all matters pertaining to the Agreement objectives.

(5) the Board, recognizing a U.S. Federal Policy of no discharge, urges that the governments adopt compatible regulations governing the disposal of vessel wastes in the waters of the Great Lakes system.

(6) that all Governments involved be urged to ensure that adequate shore facilities for the safe and sanitary removal of wastes from all vessels be provided.

CHAPTER II

INTRODUCTION

In its 1970 report to the Governments of Canada and the United States on pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River, the International Joint Commission (IJC) recommended that the Governments agree to develop compatible programs for the control of pollution of the Great Lakes System.

The two governments met in June, 1970, to consider appropriate methods for implementing the IJC recommendations, and appointed a Joint Working Group to develop agreed-upon water quality objectives and programs and other measures for preventing and controlling pollution of the Great Lakes.

The Governments met again in June of 1971 to negotiate an executive agreement between the two countries. The Great Lakes Water Quality Agreement was finally concluded in Ottawa, April 15, 1972, when it was signed by Prime Minister Trudeau and President Nixon.

The Agreement directed the IJC to assist the Governments in the implementation thereof, and to make an annual report on progress in achieving the objectives of the Agreement. The IJC was further directed to establish a Great Lakes Water Quality Board to assist it in carrying out the powers and responsibilities assigned by the Agreement. The Water Quality Board held its initial meeting in July 1972, and appointed committees to develop a report containing information required by the IJC for its annual report to the Governments.

This report is intended to serve that purpose, and presents a current assessment of water quality in the boundary waters of the Great Lakes, and of the control programs and other measures set forth in the Agreement. The report is designed to highlight problems related to water quality and control programs, and descriptive material has been limited to the extent possible. Detailed reports on water quality observations, waste loading and remedial programs have been supplied by the various jurisdictions. The volume of these data required that they be assembled as unattached appendices. These appendices are deposited with the IJC Basin Office at Windsor, where they can be inspected as desired.

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Chapter III

WATER QUALITY

III - SECTION A - SUMMARY

A general description of the present water quality of the various bodies of water in the Great Lakes drainage system permits an evaluation of compliance with the objectives set forth in the Great Lakes Water Quality Agreement. The various lakes and connecting channels are described in turn in hydrologic sequence beginning with Lake Superior. The descriptive material for each water body provides a summary of the water quality parameters and highlights of waste loading and areas of non-compliance. A complete compendium of water quality and data on direct discharge of waste load is provided as a separate appendix to the report and is available upon request.

The waste loading data in this report represent direct discharges to the boundary waters. Tributaries are considered as point sources which include municipal and industrial, as well as land drainage contributions upstream.

Lake Superior, situated as it is at the beginning of the hydrologic system, is of generally high quality. Because of its size the direct impact of many pollution sources may be hidden for many years. For this reason it is essential that this resource be especially protected for future generations as was agreed by the inclusion of a non-degradation clause in the agreement. It is not sufficient to monitor the quality of this lake in the open waters in order to protect it. The water quality parameters of interest must be measured in those local areas of known waste loading.

Generally the quality of Lake Michigan water is considered to be very good in the open waters and at the Straits of Macinac entrance to Lake Huron where all objectives are met. In the mid to southern areas of the lake, the biomagnification of DDT and PCB's in salmon, trout and certain other species of fish has prevented their sale in commercial channels. Waste discharges along the populated and industrialized shoreline cause localized water quality degradation with phosphorus, chlorides, PCB's and possibly certain heavy metals impacting on lake water quality.

Lake Huron - Georgian Bay is of generally high quality with the exception of a number of localized areas and embayments. The general scarcity of population around its shores is primarily responsible for this

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high quality water, but here again this lake will only be protected if the waters in local use areas are maintained in high quality. Saginaw Bay, certain portions of the north channel and portions of the south-east corner of Georgian Bay are already experiencing localized degradation.

The most significant lake-wide problem in Lake Erie is eutrophication due mainly to cultural over enrichment by nutrients. A major symptom of eutrophication is the depletion of hypolimnetic dissolved oxygen in the central and eastern basins in late summer. There are, however, significant near-shore areas which are strongly influenced by waste discharges from point sources and tributaries, particularly along the southern shore.

The water quality of Lake Ontario is influenced strongly by the outflow of the Niagara River which contributes 47% of the total phosphorus and 79% of the total dissolved solids. The eutrophic effect of the phosphorus loading is lessened by the great depth of the lake. Local water quality problems in the near-shore waters are associated with population and industrial centres near Toronto, Hamilton and Rochester.

The 1950 IJC Report on the Connecting Channels set forth specific water quality objectives designed to restore and maintain the waters of the connecting channels in a condition that would not impair the many uses desired of them. These objectives, the first of their kind on an international basis, anticipated national action by both countries. The recommendations were approved by the two governments to satisfy the requirements of the Boundary Waters Treaty of 1909 and were subsequently reflected in whole, or in part, in the pollution abatement programs of enforcement agencies in both countries. The water quality objectives of the Agreement of 1972 have superceded the 1950 objectives.

Progress in achieving the objectives for the connecting channels, insofar as individual communities and industries are concerned, has developed gradually. For example, eight years after the governments had approved the objectives, the total daily discharge of wastes from all industries had been reduced from 13,000 to 2,500 lbs. of phenols, from 9,000 to 4,000 lbs. of cyanides, from 18,000 to 2,500 gallons of oil, and from 3.1 to 1.6 million lbs. of suspended solids. However, water quality objectives for phenols, iron and coliform are not being met currently in all reaches of the connecting channels because of uncompleted control programs.

The constituents of municipal wastes which contribute to local or wide-spread pollution include dissolved and suspended solids, oxygen-consuming organic matter, oils, toxic materials, pathogenic organisms, and nutrients. In addition, municipal waste discharges may also include a variety of wastes from industries connected to municipal sewage systems.

The large metropolitan areas that discharge their wastes to the connecting channels are Detroit, Michigan; Windsor, Ontario; Buffalo and Niagara Falls, New York.

Storm runoff from urban areas often carries high concentrations of organic matter, bacteria and suspended solids. A number of municipalities have combined storm-sanitary sewer systems which discharge into municipal treatment plants. The capacities of these are often not large enough to cope with the increased flows during periods of heavy rainfall. Consequently, a combination of domestic and industrial wastes, as well as storm runoff from these areas, is bypassed directly to the waters of the rivers (and lakes) without being treated during these periods.

The major industrial waste producers are located in or near large municipalities and in many cases, augment the municipal waste load from these areas. They discharge large quantities of oil, suspended and dissolved solids, oxygen-consuming materials, acids, alkalis, iron, phenols, heavy metals, and toxic substances from steel making, automotive, aluminum fabricating, petroleum, chemical, pulp and paper, rubber, and food processing industries.

The descriptions contained in this chapter are based on the best available data, but these data are incomplete, and the number of parameters discussed is a selected subset of the total number of parameters needed to adequately describe water quality. Because the data are derived from a variety of sources, there is a significant variation in methods of sampling, methods of analysis, and methods of reporting the data. It was occasionally difficult to interpret the precise meaning of some of the units and the time frame over which the samples were taken was not always consistent. The Great Lakes Water Quality Board should establish specific guidelines for future reports.

The difficulties encountered in assembling the information for this chapter clearly indicate the need for an IJC directed monitoring program which would specify the frequency, spatial coverage, and parameters which should be measured to provide a uniform and consistent data set for future descriptions of water quality as required under the Agreement.

The water quality of the Great Lakes is measured against the general and specific water quality objectives as set forth in the Canada-U.S. Agreement. In the text the phrases "specific objectives" and "general objectives" refer to the objectives in the agreement. In the case of the Upper Lakes and Lake Michigan, water quality may also be compared to Federal, State or Provincial objectives or standards as they may apply.

III - SECTION B - WATER QUALITY ASSESSMENT PROGRAMS

CANADA

The Canadian government conducts extensive water quality assessment programs on the Great Lakes. In conjunction with this program, ships of "Environment Canada" from the Canada Centre for Inland Waters have occupied monitor stations in Lakes Ontario, Erie, Huron, Georgian Bay, and northern Lake Michigan several times per year. In 1972 the M/V Martin Karlsen was used to carry out 9 monitor cruises and occupied 1,026 monitor stations. The Water Quality Survey monitored selected stations on the connecting channels.

Many other cruises by CCIW vessels provide data on lake quality while engaged primarily in research programs. These included the International Field Year for the Great Lakes (IFYGL) and sediment geochemistry sampling. The total cruise program for CCIW in 1972 amounted to 100 cruises covering in excess of 40,000 n. miles; the collection of 20,412 water samples, and 1,065 plankton hauls, from 2,594 monitor stations as well as many other observations and scientific activities.

UNITED STATES

Since 1946, the International Joint Commission (IJC) has maintained a water quality monitoring program to assess the overall quality of the interconnecting channels. The 1971 water quality data was collected from ten IJC ranges which spanned from the U.S. to Canadian shores along the Detroit River. A total of 14 stations were sampled in the Clinton River - Lake St. Clair area.

The U.S. Geological Survey (USGS) presently maintains monitoring stations on the Detroit River at Water Works Park and Trenton, Michigan.

Mercury sampling continued in the Detroit River in 1971. EPA also collected bottom samples for mercury analyses in the area of the cutoff from the St. Clair River to Lake St. Clair.

Investigations on the Detroit River, Turkey Creek, and the Canal River were conducted in order to formulate recommendations on proposed dredging projects.

Beginning in 1970, EPA with the adjoining States have cooperatively collected water quality surveillance data at strategic Lake Erie intakes. Chemical, bacteriological and plankton data are obtained monthly.

The Environmental Protection Agency maintains a cooperative water pollution surveillance station providing weekly analyses of the Buffalo municipal water plant intake water which is representative of the Lake Erie water entering the Niagara River. EPA has also monitored the water at the river mouth and occasionally carried out special sampling programs on the river. The IFGYL program currently in progress will provide relatively complete analyses, including most metals, of samples collected at the mouth every three days over a one year period. The Buffalo Sewer Authority collects coliform data above and below its plant outfall which can be made available through N.Y.S.D.E.C.

EPA is participating in the on-going International Field Year for Lake Ontario. This program will assess the water quality of the main body of Lake Ontario with a total of 31 sampling cruises covering a total of 105 stations at various depths with samples being analyzed for a wide range of parameters. In addition, the U.S. samples tributary mouths every three days with near-shore sampling taking place on an approximate monthly basis.

Prior to the beginning of the IFYGL program, the Environmental Protection Agency conducted a surveillance program on the major tributaries to Lake Ontario. This program will be resumed upon completion of the IFYGL sampling program about April 1973. Since 1966, EPA has monitored sanitary conditions at the Monroe County public bathing beaches and has also maintained a surveillance program to monitor the quality of dredged spoil from U.S. harbors. In addition, the EPA has contracted the U.S.G.S. to sample Eighteen Mile Creek and the Black River monthly, Johnson Creek and the Salmon River (Oswego County) seasonally with emphasis on the summer months for pesticides.

EPA has maintained a surveillance program for water quality on the St. Lawrence River. The quality of dredging spoil from harbors on the St. Lawrence is also monitored.

United States Geologic Survey monitoring activities in the St. Lawrence area include sampling by major tributaries on an approximate monthly basis.

Weekly sampling of the St. Lawrence at Massena is carried out by the Water Pollution Surveillance System of the National Water Quality Network. The analyses originally covered a broad spectrum of chemical and biological parameters with a history dating back to 1957. It has recently been cut back to a handful of chemical parameters and should be re-examined in light of the fact that this station and the Buffalo water intake station are two of the few stations that have lengthy and complete historical records of water quality information.

ILLINOIS

Water quality data were obtained from three areas of Lake Michigan: (1) Open Water, (2) U.S. Established Dump Area, and (3) Calumet Harbor. Descriptions of the areas and the sampling program are presented in the following sections.

Water Quality Standards for Lake Michigan, Rules and Regulations SWB-7, adopted by the Illinois Sanitary Water Board, served as the basis for evaluation of 1971 monitoring results in the Open Water and U.S. Established Dump Area. Rules and Regulations SWB-15 are applicable to the waters of Calumet Harbor. In 1971, the Pollution Control Board revised these standards with respect to three parameters: temperature, phosphorus and mercury (with the passage of the Environmental Protection Act in 1970, the Sanitary Water Board was phased out and all standard-setting responsibilities were transferred to the Pollution Control Board).

Lake bed and water samples were collected by surveillance personnel in the Agency's Division of Water Pollution Control. All analyses were performed by personnel of the Agency's Chicago Laboratory. The Division of Waterways, Illinois Department of Transportation (formerly Public Works and Buildings), provided a boat for the Agency's lake bed and off-shore water quality sampling.

Open Water

The raw water intakes at the municipal water filtration plants which utilize Lake Michigan as their source of water supply have been designated in SWB-7 as the control points for monitoring the quality of the open waters.

Twelve water plants were included in the 1971 monitoring program: Zion-Benton, Waukegan, North Chicago, Lake Forest, Highland Park, Glencoe, Winnetka, Kenilworth, Wilmette, Evanston, Chicago Central and Chicago South. Two of the plants, Zion-Benton and Chicago Central, are new additions to the monitoring program and provide additional input to the water quality data bank. Zion-Benton became operational in late 1970 and was incorporated into the Agency's sampling program in the summer of 1971. Also, in late 1970, the crib intake line at the Chicago Central plant was completed and Agency sampling at this facility began in January of 1971. Raw water samples were collected twice per month throughout 1971 with the exception of the Zion-Benton plant as noted above.

In addition to the water plant sampling program, water samples were collected by boat in the open waters of the lake. During the year, eight such boat sampling cruises were conducted. These samples were collected 4 miles off-shore from the following eight locations: Wisconsin-Illinois State Line, Zion, Waukegan, Highland Park, Winetka, Evanston and the Chicago Central water plant and Chicago South water plant.

An area at the southern end of Lake Michigan has been designated by the Federal Government as a site for the dumping of non-pollutional harbor dredgings and other materials. This area is located approximately 10 miles east of the Illinois shore between the lakeward extensions of Montrose Avenue and Calumet Harbor. Senate Bill 1794, passed by the 75th General Assembly in 1967, prohibits the issuance of permits by the Illinois Department of Transportation (formerly the Dept. of Public Works and Buildings) for the deposition of rock, earth, sand or other material or any refuse matter of any kind or description in Lake Michigan without the concurrence of the Environmental Protection Agency.

One water sampling cruise was made to the Dump Area in October 1971 to collect samples for water quality determination.

Open water samples were collected for water quality determination at the raw water intakes of twelve municipal water filtration plants on a twice-per-month schedule in 1971. Additional samples were collected by boat at eight stations located 4 miles off-shore. Bottom dredge samples were obtained at 63 established lake bed stations and 69 special stations.

The monitoring of pesticides, mercury and heavy metals was expanded in 1971 and included the collection and analysis of Lake Michigan fish, water and sediments for the presence of chlorinated pesticides, polychlorinated biphenyls, phthalates and heavy metals.

INDIANA

In 1957, the State of Indiana initiated a water quality monitoring program. The original sampling network included 5 stations in the Great Lakes Basin. At the present time, there are 21 sampling stations located on tributaries to Lake Michigan and Lake Erie. In addition, 5 water plant intakes on Lake Michigan are sampled as part of this program. All but two stations are sampled on a bi-weekly basis.

With few exceptions, all samples are analyzed for dissolved oxygen, chlorides, pH, fecal coliform bacteria, temperature, suspended matter, volatile suspended matter, nitrate, total phosphate, specific conductance and biochemical oxygen demand. At many of the monitoring stations, additional analyses are made.

This program provides data that are used to measure the general water quality characteristics of Indiana Waters in the Great Lakes Basin at important locations and to record trends in water quality.

During the bathing season, samples are collected weekly from 12 Lake Michigan beaches to determine the bacteriological water quality.

The State has two Robot Water Quality Monitoring Stations on tributaries to Lake Michigan. These are located near the mouth of Burns Ditch and approximately one mile upstream from the mouth of Trail Creek. These stations continuously monitor for pH, dissolved oxygen, specific conductivity, temperature and turbidity and transmit the data hourly to a central station in the State Board of Health Buidling where it is recorded.

In order to determine the effects of various point discharges upon receiving waters and to obtain information regarding the extent of compliance with established water quality criteria, a number of intensive surveys are conducted in the Great Lakes Basin each year. During these surveys, samples are composited over a 24-hour period from municipal and industrial waste outfalls and from the receiving stream above and for a distance below the point(s) of discharge.

During the last four fiscal years, a total of 152 24-hour surveys and a number of chemical grab and biological surveys were conducted in the Great Lakes Basin.

A pesticide monitoring program was initiated in the fall of 1969 and terminated in September of 1971. During this period, samples of water, suspended sediment, invertebrates, periphyton and zooplankton were collected from stations on the Indiana Harbor Canal, Burns Ditch, Trail Creek, the St. Joseph River at South Bend and Bristol and the Maumee River near the State Line.

A PCB monitoring program has been initiated which involves the collection of approximately 20 samples a month from tributary streams and industrial and municipal outfalls.

This program will be expanded to include the collection of samples of runoff from landfills and other point sources and may be expanded to include the collection of suspended sediment and invertebrate samples from receiving streams.

MICHIGAN

In 1963 the Michigan Water Resources Commission commenced a routine water quality monitoring program principally at the mouths of major tributaries to the Great Lakes and connecting waters. This program evolved to include Great Lakes swimming beach monitoring in 1965 and currently includes a number of Great Lakes domestic water supply intakes.

The Michigan Water Resources Commission also takes water quality samples of Detroit River water at several ranges (cross-sections) located at varying distances upstream from the mouth. Fifty-five stations are sampled, with 20 of those located at the head and the mouth of the river. The special emphasis at the head and mouth was designed to facilitate calculation of river loadings at those two points. These stations, along with 5 others on the Rouge River near its confluence with the Detroit River, are sampled approximately six times between April and November.

Sixteen water quality parameters, including those for which IJC objectives are established are determined on these samples. The Ontario Ministry of the Environment takes a similar number of samples at the same stations as part of a cooperative sampling program.

The concentrations and river loadings of 16 parameters are determined in the Detroit River as it flows into Lake Erie by a series of approximately 60 samples taken from April to November. The Ontario Ministry of the Environment also takes a similar number of samples at the same stations as part of a cooperative sampling program.

Michigan's program to monitor radioactivity on a statewide basis commenced in 1955. The current program involves quarterly gross beta analysis at 45 stations, including 14 water intakes from the Great Lakes and connecting channels and 12 major tributaries at their confluence with the Great Lakes.

In addition, monthly water samples from stations in the vicinity of nuclear power stations are analyzed for gross beta activity, tritium and specific isotopes of concern. Aquatic organisms living in the vicinity of nuclear facilities and sediment from these sites are collected and analyzed twice a year for gross beta and specific isotope activity.

Michigan's monitoring programs to identify water quality problems of specific contaminants such as thermal, PCB, pesticides, mercury, and heavy metals are discussed in Chapter 4.

In addition the Water Quality Appraisal Section conducts a wide variety of investigations involving physical, chemical and biological responses of receiving water systems to evaluate effects of waste discharges and other cultural activities. These studies serve as a base for enforcement action by the Commission.

MINNESOTA

Since 1953, the Minnesota Pollution Control Agency has maintained a water quality monitoring program to assess the overall quality of the waters in the State of Minnesota. Currently included in this program are two sample stations at water plant intakes along the Lake Superior shoreline and a station at the St. Louis River outlet to St. Louis Bay. These sample stations have been scheduled to be sampled on a monthly basis. Mid-lake data is also now being obtained from a yearly traverse run across the western part of the lake. In addition to the routine monitoring program, random samples are taken in problem areas to identify pollution sources and to evaluate the change in water quality.

NEW YORK

New York State cooperates with EPA in several water quality surveillance studies. In addition it has a rather extensive monitoring program of its own.

It routinely samples the following tributaries of Lake Erie:--Cattaraugus Creek, Eighteen Mile Creek, and Canadaway Creek.

An automatic monitor is located downstream of the City of Buffalo and this is supplemented by routine samples below the Buffalo River, upstream of the major Niagara Falls industrial discharges and at the mouth of the Niagara River.

In Lake Ontario routine samples are collected from a station off Fort Niagara, the water intakes of Eastman Kodak and the Monroe County Water Authority within the Rochester area and the City of Oswego water intake. There are also surveillance stations at the mouths of the Genesee, Oswego and Black Rivers.

On the St. Lawrence River there are stations near Cape Vincent, Ogdensburg and Massena as well as at the mouth of the Oswegatchie and Grass Rivers.

All routine samples are collected monthly and cover a wide range of parameters.

OHIO

Since July 1, 1968, Ohio in conjunction with the Ohio District Office of the Federal EPA, along with the owners and operators of seventeen public water supplies, has had an ongoing program of assessing the water quality of the Ohio portion of Lake Erie. At most of these plants the following analyses are run on a daily basis:- (1) Temperature, (2) Turbidity,

(3) Conductivity, (4) Dissolved Oxygen, (5) Chlorine Demand, (6) pH, (7) Total Alkalinity, (8) Total Hardness, and (9) Total Coliforms (MPN-Confirmed). In addition chemical analyses for sulphates, chlorides, total iron and manganese are generally made on a weekly basis. Analyses for the following metals were made on samples collected once every two months; arsenic, cadmium, chromium, copper, lead, silver and zinc. For assessing the eutrophic condition of the lake, analyses for total and soluble phosphorus, organic ammonia and nitrate nitrogen, along with COD and DO, were made twice a month at each of the seventeen Ohio Water Intakes by the Ohio District Office.

In addition, the laboratory of the Federal District Office has performed analyses for total coliform, fecal coliform, standard Plate counts, as well as Plankton counts.

The Ohio Department of Health in cooperation with the Ohio Department of Natural Resources and various local health departments carried out a bacterial sampling program of Ohio beaches during the summers of 1971 and 1972. Sampling was completed on Mondays and Wednesdays with at least 8 samples per month.

PENNSYLVANIA

Water quality monitoring in Pennsylvania's portion of Lake Erie is undertaken by the Erie County Department of Health, the City of Erie, and the Pennsylvania Department of Environmental Resources and U.S. E.P.A. Four routine water quality stations are presently operational - two off Presque Isle, one in the outer harbor near the city of Erie and Hammermill Paper Company outfalls, and one in the inner harbor (Presque Isle Bay).

The Presque Isle State Park beaches (DER) are routinely sampled from mid-May through mid-September.

A program of non-routine chemical sampling and biological assessment (fish and benthic animals) on the many small tributaries is accomplished by the aquatic biologists of the Erie County Health Department, the Pennsylvania Fish Commission and DER.

Heavy Metals

Eighty-one analyses were performed for each metal. Analyses were for mercury, lead, cadmium, chromium, copper, iron and aluminum.

High concentrations of mercury (greater than 5 μg/l) were found in the first series of samples, but were generally undetected since. Due to an infrequent number of detections of mercury, lead, cadmium and chromium, the stations were ranked according to detection frequency for these metals. The frequency was:

Off Presque Isle	-	38
Outer Harbor	-	32
Inner Harbor	-	30

Pesticides

Pesticide analyses for DDT, Lindane, Aldrin, Dieldrin and Heptachlor were conducted on 28 samples per station. None of these substances were detected.

Quantitative phytoplankton and zooplankton data are also available for these stations.

WISCONSIN

Since 1961, Wisconsin has had a continuing stream monitoring program to determine the water quality of major streams. Samples are taken on a monthly basis in order to assess changes in water quality throughout the year. In the Lake Superior basin this consists of two tributary monitoring stations and one public water supply intake. In addition, comprehensive surveys of pollution sources and water quality in the Wisconsin portion of the lake were conducted during 1965 and early 1966 and July 1968, respectively.

In the Lake Michigan basin the monitoring program consists of tributary monitoring stations and one public water supply intake. Recently, five automatic monitoring stations have been established on the Fox River. Parameters are measured hourly and transmitted to Madison and stored on computer tape.

ONTARIO

The general objectives of Ontario's water quality assessment programs can be summarized as follows:

(1) To determine the water quality in the near-shore waters of the Great Lakes and to compare the water quality with the general and specific water quality objectives defined in the Agreement and with the use criteria of the Ontario Ministry of the Environment.

(2) To investigate the occurrence of trans-boundary movement of substances which may contribute to the deterioration of water quality.

(3) To identify pollution problems and to define remedial or preventative control measures required to meet the objectives contained in the Agreement and the standards of the Ontario Ministry of the Environment.

(4) To assess the adequacy of existing water quality objectives for the Great Lakes and where necessary recommend new objectives for these waters which reflect the existing high standard of water quality.

(5) To develop response models and define mixing zones which describe the dispersion of pollutants and establish the effects of varying quality of discharge and permit the determination of optimum locations of waste outfalls.

(6) To quantify the pollutant loadings to the Lakes from municipal, industrial and tributary sources in the Province for those parameters specified in Annex 1 of the Agreement.

The Ontario Ministry of the Environment has, since 1964, conducted an extensive water quality monitoring and surveillance program in the Great Lakes drainage basin. Information is gained on developing problems and the extent of compliance of waste discharges with the water quality standard. At present, some 2,000 locations on the Great Lakes and inter-connecting channels are monitored up to seven times a year with an additional 650 locations on tributary streams monitored 12-18 times a year.

In the Great Lakes system the monitoring locations place emphasis on areas of critical water use especially the lower lakes portion. Starting at the head of the system, the breakdown of sampling locations is as follows:

Lake Superior	200
St. Mary's River	90
Lake Huron, Georgian Bay and North Channel	295
St. Clair River	140
Lake St. Clair	100
Detroit River	235
Lake Erie	420
Niagara River	65
Lake Ontario	390
St. Lawrence River	70

More recently a sediment sampling program has been employed to determine the extent of contamination of lake and river beds by such metals as mercury, lead and zinc and by organic matter originating from municipal and industrial waste discharges.

Among the parameters determined routinely are temperature, pH, alkalinity, turbidity, conductivity, nitrogen (kjeldahl, ammonia, nitrate and nitrite), phosphorus (total and soluble), chlorides, phenols and total and fecal coliforms with the majority of analyses being performed at on-shore laboratories in London and Toronto. Additional parameters such as ether solubles, cyanides, iron, sulphates and sulphites are examined to define the nature and extent of the effect of waste inputs on the receiving waters.

Monitoring of municipal and industrial waste discharges in the Great Lakes basin is maintained and correlated with the receiving water data. The selection of parameters for examination is based on providing characterization of wastes as they affect water quality. There are over 60 municipal and 85 industrial facilities which discharge wastes directly to the Great Lakes. Some 200 municipalities and 400 industries discharge treated waste effluents into the waters of the entire drainage system in the Province.

Other programs include aerial surveillance and vessel patrols of sources of industrial wastes and sites where spills of oil and other materials may occur.

In 1965, the Ontario Ministry of the Environment began a phytoplankton inventory program involving sample collection from near shore Canadian waters. Samples are now taken at water intakes in each lake and the St. Lawrence River. This information is used for water quality control at the water works and will be most useful in tracing the progress of future nutrient pollution control programs. Considerable effort has been devoted to mapping the distribution and abundance of the green alga, Cladaphora.

Shorter term studies of the environmental response of major tributary streams to discharges of treated wastes, e.g. the Thames and Grand Rivers, and modelling studies of dispersion patterns in the vicinity of tributaries, water intakes and waste discharges are also carried out by the Province. The information from these studies provides the basis for establishing standards and effluent requirements for all receiving waters in the Province.

Since 1966, the Ministry of the Environment, in cooperation with the Ministry of Natural Resources or their predecessor organization and the Ontario Pesticides Laboratory, has analyzed fish for DDT and dieldrin in several lakes of the Province, including the Great Lakes. This program was expanded in 1969 to include the effects on fish of heavy metals including mercury. Commercial fisheries on these waters where mercury contaminated fish have now been identified, have been closed and sport fishermen have been warned not to eat their catches.

The Radiation Protection Laboratory of the Ministry of Health carries out analyses of radioactive substances in water.

III - SECTION C - WATER QUALITY CONDITIONS

LAKE SUPERIOR

WATER QUALITY

General

In general, the quality of the water of Lake Superior is considered excellent due to the extremely low dissolved and suspended solids, the extreme clarity, the high oxygen concentrations, and the low concentrations of chemical nutrients and other ions.

One possible problem with excessive levels of DDT, PCB's and mercury in lake trout has been suggested from a preliminary sampling program conducted by Michigan.

Nutrients

The areal distribution of the mean concentrations of total phosphorus, soluble reactive phosphate and inorganic nitrogen in the surface waters of Lake Superior are plotted on figures 1 - 3 respectively.

In the major open lake areas the mean concentration of total phosphorus was 3 µg/l increasing to 10 µg/l in the extreme western basin. Higher values of 4 and 5 µg/l were also observed in the Nipigon Bay and Thunder Bay areas. The highest value noted was 26 µg/l in the Duluth - Superior area with 11 - 12 µg/l in Thunder Bay.

The distribution of soluble reactive phosphate (figure 2) appears to be uniform over the whole lake with no evidence of seasonal variation. These low values are near the lower detection limit of the present method of analysis.

Figure 3 shows the distribution of inorganic nitrogen in the surface water. Values in the general range 230 - 330 µg/l are recorded with most of the lake being in the range 260 - 280 µg/l. Variation over the lake is small, about 50 µg/l.

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Chlorophyll a

In figure 4 the distribution of mean total chlorophyll a for 1970-1971 is presented. The values are low, generally less than 2 μg/l with a slightly higher value in the extreme western end. Maximum values are shown in figure 5 with the highest concentration being in the western basin.

Dissolved Oxygen

Figure 6 presents the data for the percent oxygen saturation in the bottom water for October, 1971. At 20°C, which is near the maximum temperature attained by the surface waters of the lake, an oxygen concentration of 6 mg/l is equivalent to 68 percent saturation. Overall, the lake bottom is well saturated with oxygen and shows no sign of oxygen depletion. Additional data from previous cruises showed similar results.

Near Shore Waters

Characteristic of the high quality of Lake Superior waters are dissolved solids levels of 60 - 65 μg/l and the virtual absence of coliform bacteria along most of the shoreline of Ontario. In Michigan, based on data from nine municipal water intakes sampled annually and 186 beach samples for bacteriological counts, the inshore water quality of the lake is very good. One area of poorer water quality has been identified: - the mouth of the Mineral River, where filamentous algae is reported to be a nuisance.

In general, the Wisconsin waters of the lake are of extremely high quality as reflected in a 1968 study, although in several localized areas the water quality is impaired by waste discharges and other factors. This is true of the Superior - Duluth harbor area. Other problem areas are associated with paper mill suspended solids at Ashland and naturally occurring erosion and sedimentation of red clay along the greater portion of the Wisconsin shoreline, extending into Michigan at the Portage ship canal.

Specific Areas of Non-Compliance

The area of Lake Superior adjacent to Silver Bay, Minnesota is considered to be an area of non-compliance due to the industrial discharge of taconite tailings in amounts sufficient to cause pollution.

The areas known as St. Louis Bay and Superior Bay near Duluth - Superior are relatively isolated from the lake proper but are considered to be areas of non-compliance due to inadequately treated industrial and municipal waste. The Chequamegon Bay area of Lake Superior is also considered an area of non-compliance for the same reason. There are a few areas of potential non-compliance along the shoreline in Minnesota, Wisconsin, and Michigan, which are attributable to inadequately treated domestic discharges or to the lack of adequate nutrient removal. Although these small isolated areas may not contain nutrients sufficient to create nuisance growths of aquatic weeds and algae, they do not presently comply with treatment requirements or the non-degradation objectives contained in federal/state standards.

The harbour areas at Thunder Bay, Red Rock (Nipigon Bay), Terrace Bay (Jackfish Bay), and Marathon (Penninsula Harbour), are considered areas of non-compliance with the water quality objectives. Sediment surveys and benthic fauna studies in these areas have shown the accumulation of oxygen-consuming pulp and paper mill solids and undesirable changes in the benthic communities. Sheens of oil and other floating materials are encountered at those locations; as well, aesthetic impairment of water quality is caused by the discharge of highly coloured industrial wastes, while tainting of fish flesh has also been observed. Contamination of fish by mercury has been observed in samples taken from Thunder Bay and Penninsula Harbour.

Untreated municipal sewage discharges from combined sewers contribute to local impairment in parts of Thunder Bay, while elevated levels of coliforms and nutrients are encountered in Nipigon Bay at Red Rock and Penninsula Harbour at Marathon.

WASTE LOADINGS

Data on basin waste loading parameters are presented in Table 1.

The total phosphorus load to the lake is 2,385 tons per year, of which 73% is from tributaries. Direct municipal sources contribute 21% and industrial sources the remaining 6%. Altogether the U.S. contributes 62% of the total tributary load. Not unexpectedly, the largest municipal phosphorus loading is from the Duluth - Superior area, corresponding with the largest centre of population.

The total annual BOD loading is 201,320 tons per year. Of this total, the amount contributed by industry, 47%, almost equals the 51% entering the lake through the tributaries. The Canadian contribution is considerably larger than the U.S. contribution, being 81% of the total. The principal industrial contributors are the pulp and paper industries and, to a lesser extent, grain handling industries in Canada, and the forest products industry in the U.S.

The annual reported loading of total dissolved solids is 3,633,884 tons per year to the lakes, with approximately 89.8% entering through the tributaries. The industrial contribution is 10%. Of the total load, 82% enters from the Canadian side, with 72% of the total load being from the Nipigon River basin.

The total annual reported loading of suspended solids is 24,899,350 tons per year with the vast majority, 98.6%, being contributed by a single source in Minnesota, the Reserve Mining Company, jointly owned by Republic and Armco Steel Companies.

TABLE 1

LAKE SUPERIOR - SUMMARY OF WASTE LOADINGS

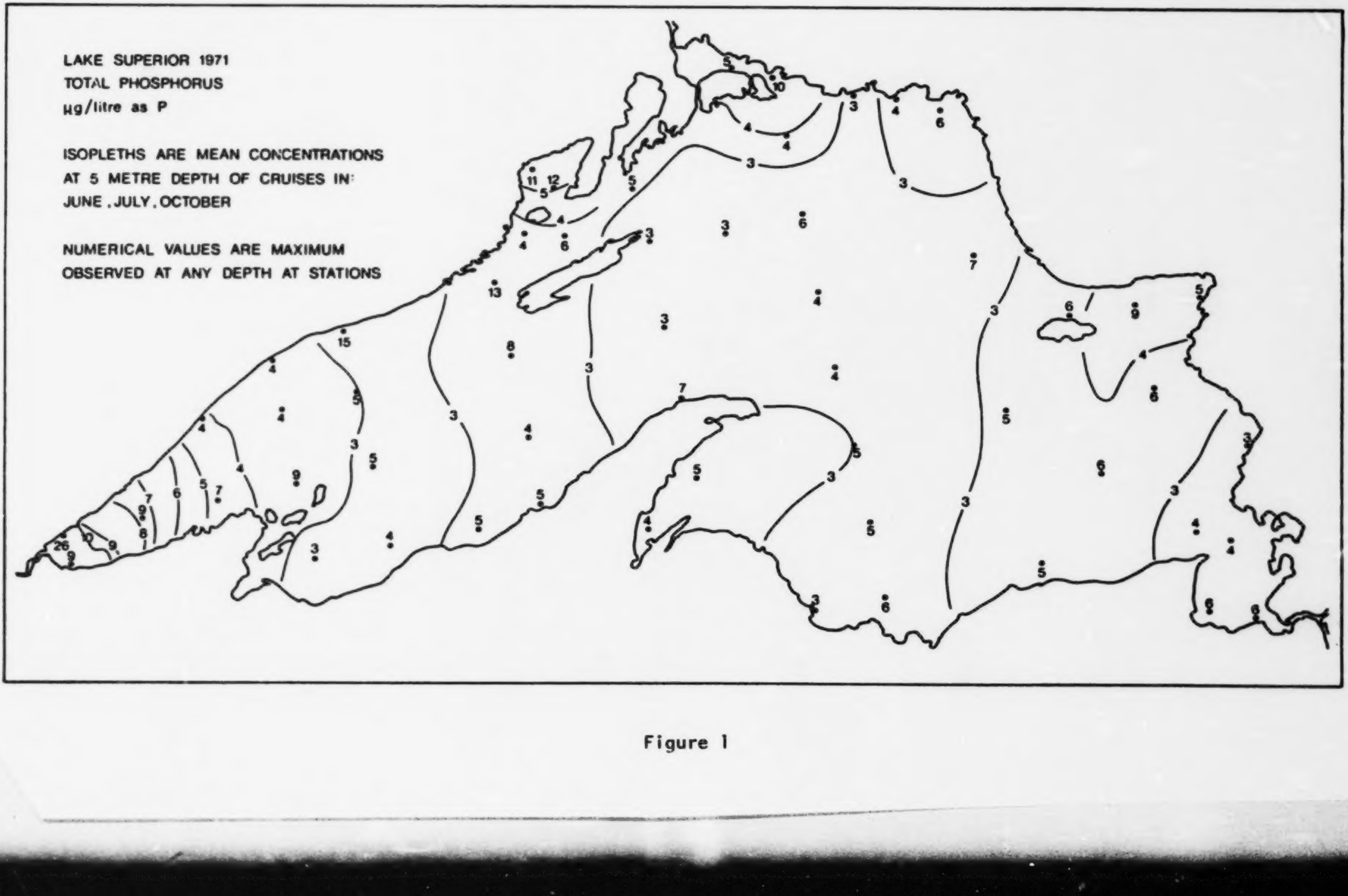
(Short tons per year)

	Flow (cfs)	Total P	BOD_5	TDS	SS
CANADA					
Tributaries	23,780	670	73,990	2,618,720	130,650
Industrial	280	130	88,460	366,400	26,110
Municipal	15	105	900	3,940	890
UNITED STATES					
Tributaries	9,380	1,080	28,710	644,800**	212,610
Industrial	1,435	*	5,780	ND	24,526,840
Municipal	30	400	3,480	ND	2,250**
TOTAL:	34,920	2,385	201,320	3,633,860	24,899,350

* - Total phosphorus discharged to Lake Superior by Reserve Mining Company at Silver Bay is not included because the amount of available phosphorus as a nutrient has not been determined.

** - Incomplete information.

ND - No data.


LAKE SUPERIOR 1971
TOTAL PHOSPHORUS
µg/litre as P

ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
JUNE, JULY, OCTOBER

NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS

Figure 1

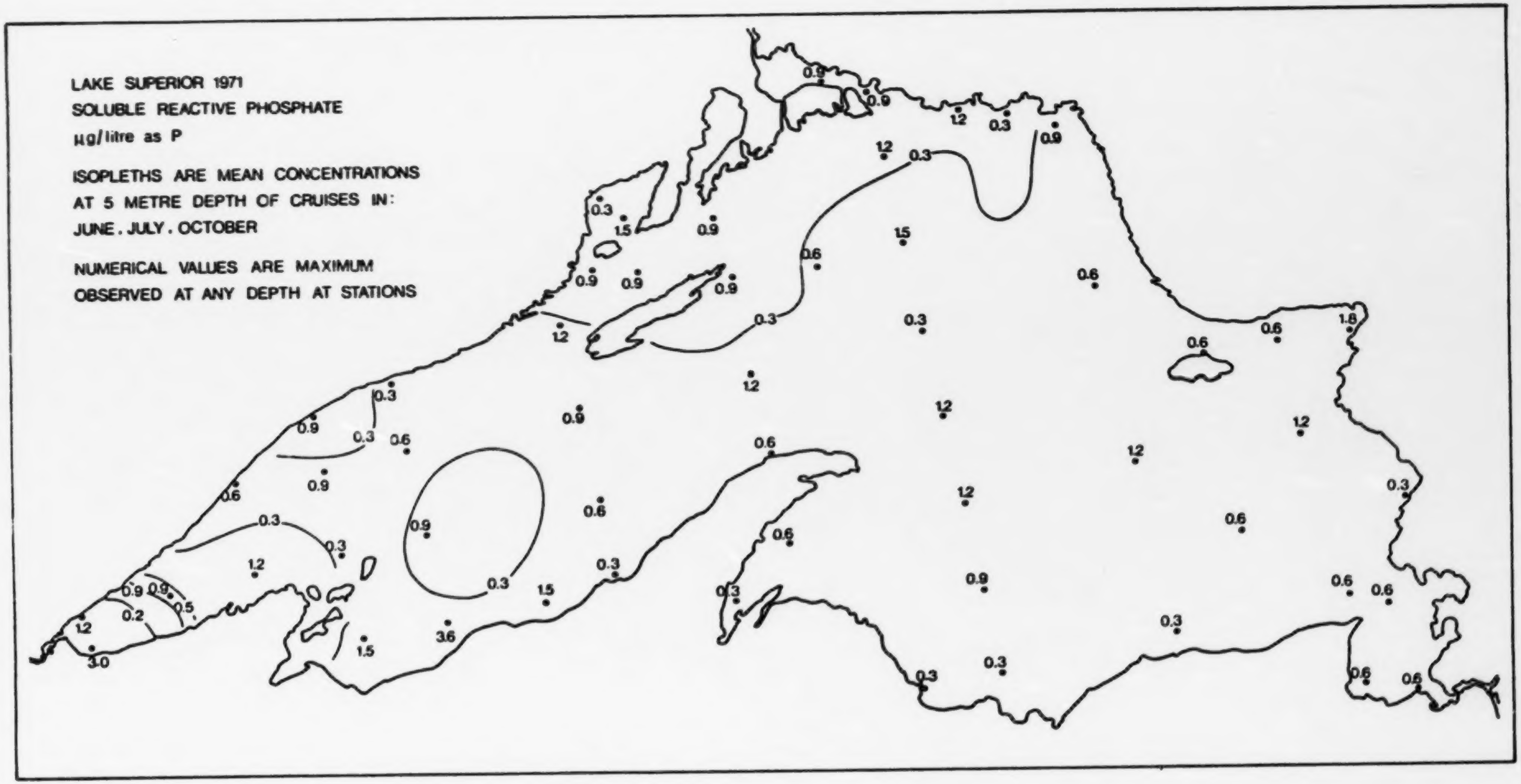

LAKE SUPERIOR 1971
SOLUBLE REACTIVE PHOSPHATE
µg/litre as P
ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
JUNE. JULY. OCTOBER
NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS
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Figure 2

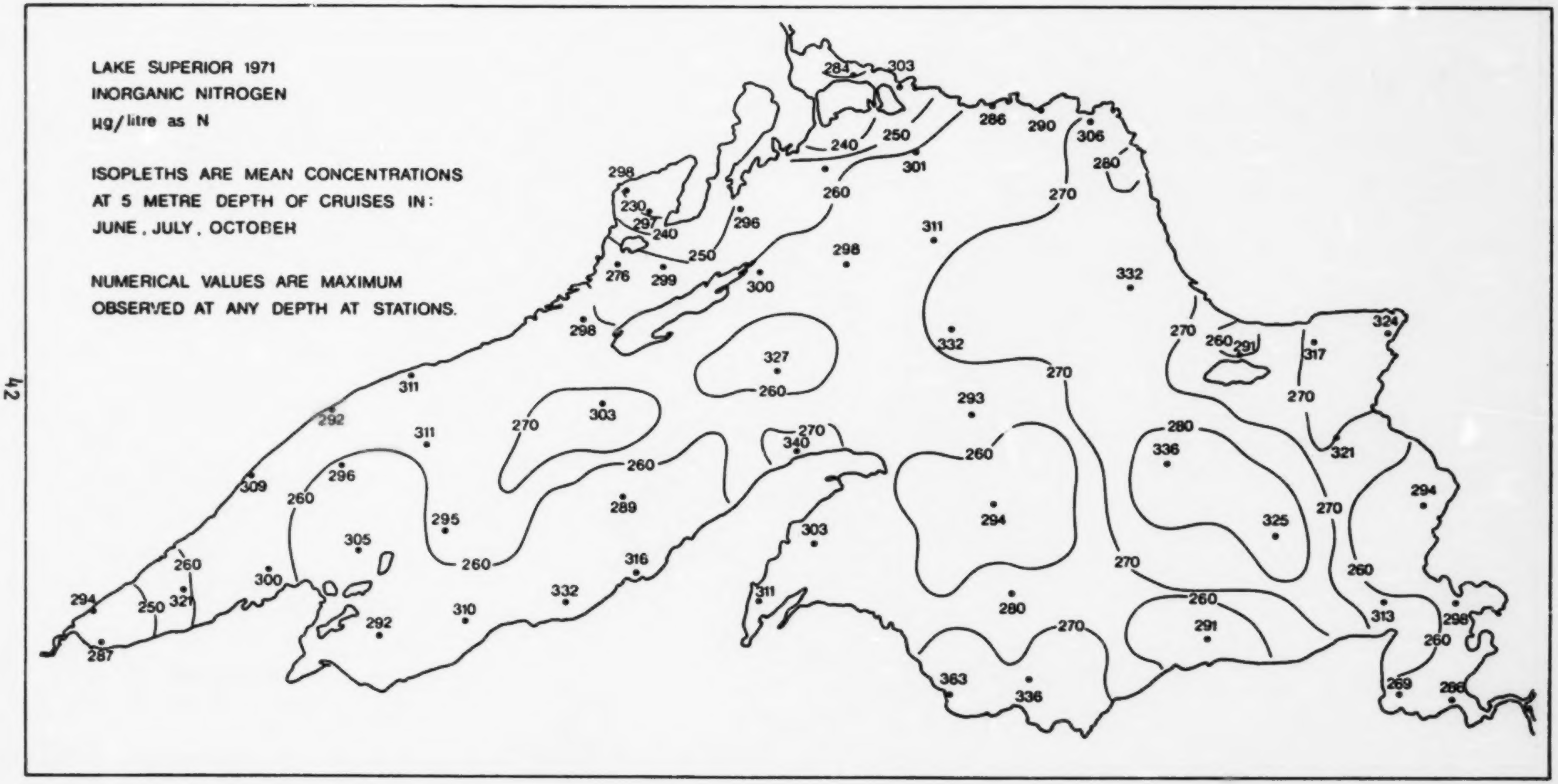
LAKE SUPERIOR 1971
INORGANIC NITROGEN
µg/litre as N
ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
JUNE, JULY, OCTOBER
NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS.
284
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Figure 3

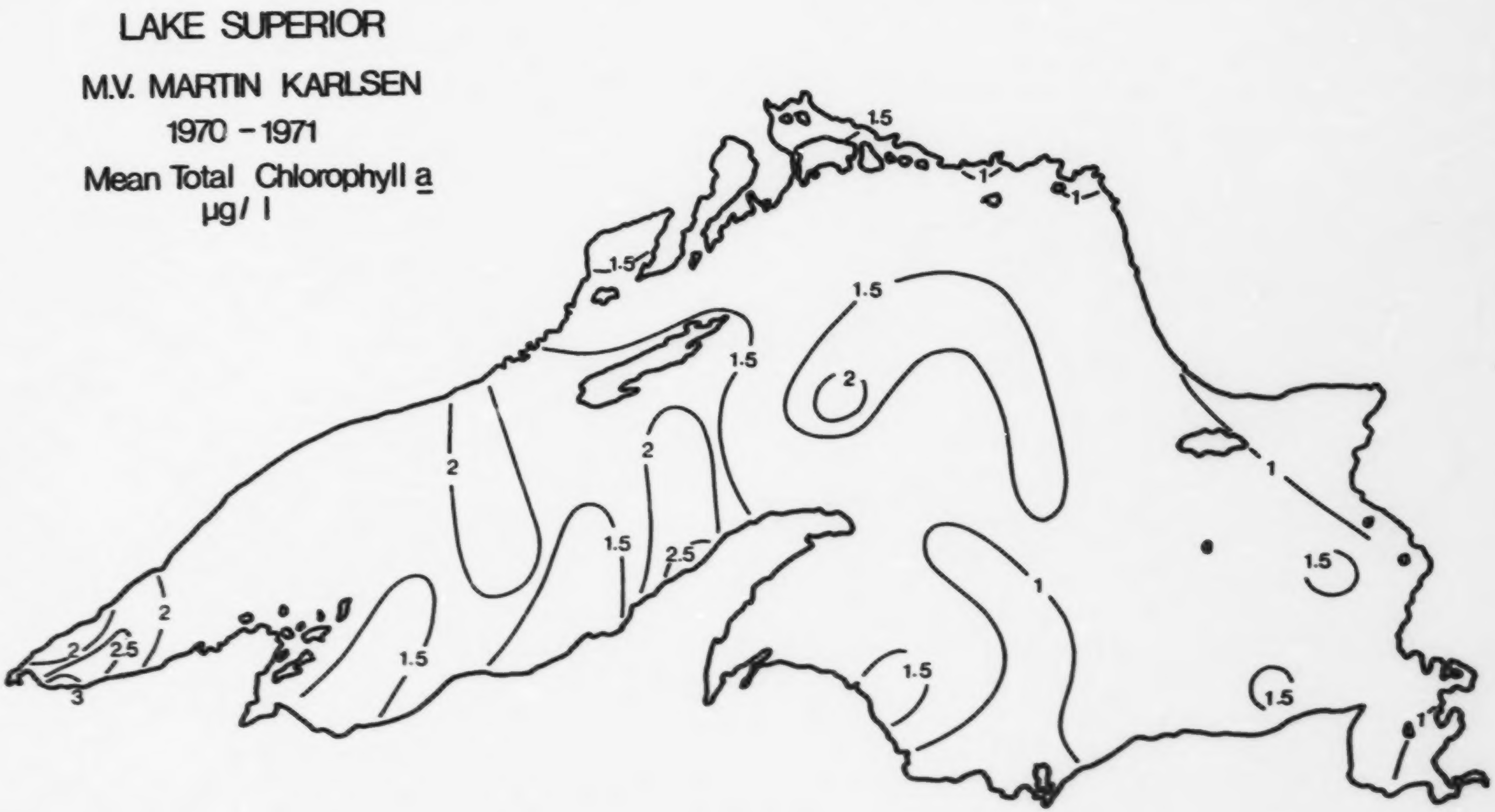
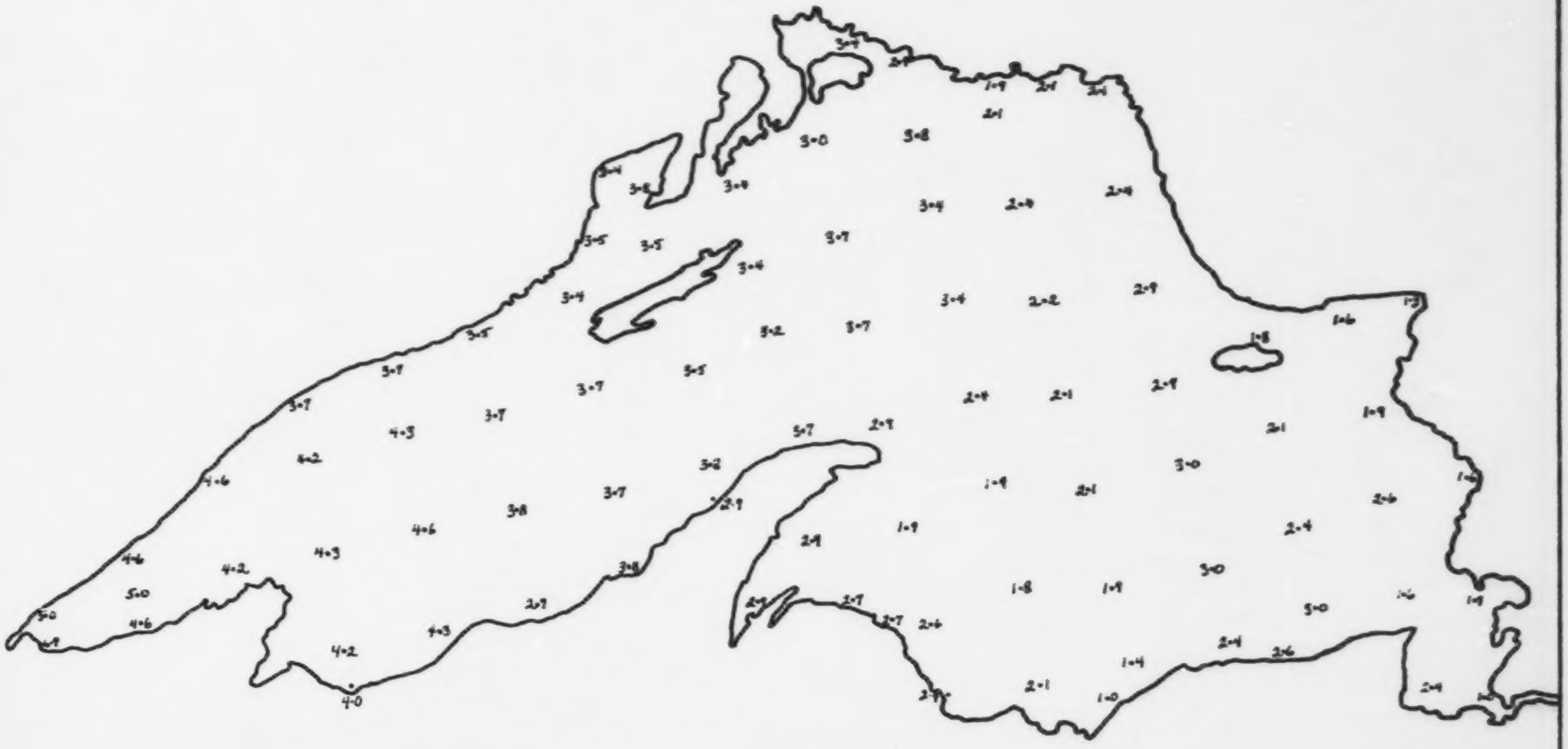

LAKE SUPERIOR
M.V. MARTIN KARLSEN
1970 - 1971
Mean Total Chlorophyll a
µg/ l
1.5
1
1
1.5
1.5
1.5
2
2
2
1.5
2.5
1
1.5
1.5
1.5
1.5
1
2
2.5
2
3
1.5

Figure 4



LAKE SUPERIOR
1970 - 1971
Maximum Total Chlorophyll a

Figure 5

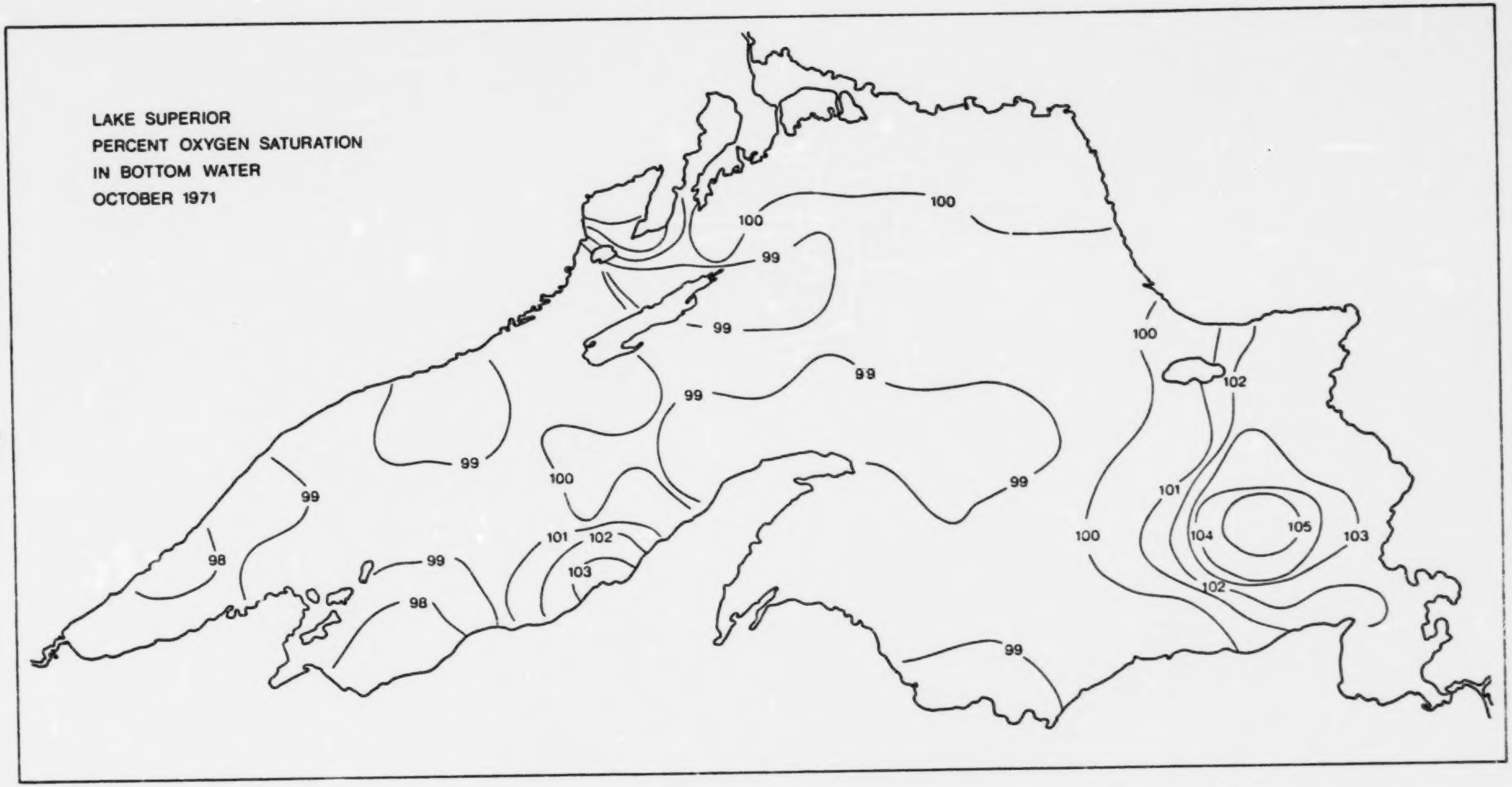

LAKE SUPERIOR
PERCENT OXYGEN SATURATION
IN BOTTOM WATER
OCTOBER 1971

Figure 6

THE ST. MARYS RIVER

The St. Marys River receives municipal waste effluents from the sewage treatment plants in both Sault Ste. Marie, Michigan and Ontario. On the United States side, there is no significant discharge of industrial wastes to the river at the present time. On the Canadian side, steel manufacturing and paper products are the primary industries. Waste outfalls are located in figure 7.

Algoma Steel Company, Abitibi Paper Company and Mannesman Tube Company located in the vicinity of the locks at Sault Ste. Marie, Ontario, are the major water users and discharge wastes to the river.

WATER QUALITY CONDITIONS AND AREAS OF NON-COMPLIANCE

The water quality of the St. Marys has improved in recent years because of better treatment by municipal waste treatment plants on both sides of the river and a reduction in industrial effluents from the Michigan side.

During 1972, the water was generally found to be of high quality, characteristic of its Lake Superior supply. There were, however, on the Canadian side, areas of significant deterioration; notably, the Algoma Steel Corporation boat slip, which receives discharges from this Sault Ste. Marie, Ontario, steel mill, and the area below the Canadian Navigation locks where the Algoma Steel and the Abitibi Paper Company effluents discharge. The waters in the boat slip exhibited various colours from grey to red, while the water below the locks was often covered with an oil sheen and displayed local discolouration from black oily wastes of Algoma and the whitish wood fiber-containing wastes of Abitibi. The oily sheen was present on all sampling dates and was found to extend approximately half-way across the river width, some nine miles downstream. Mats of oil and wood chip fiber float downstream from the locks, often as far as Lake George in the east channel.

Although taste and odour problems of a phenolic origin have not been reported, the objectives for phenol concentrations were consistently exceeded below the Canadian locks and downstream on the north side of Sugar Island as far as Lake George. Below the Algoma Steel main trunk sewer outfall, the phenol values ranged from 3 ppb on the U.S. side to 15 ppb on

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the Canadian side during 1972 surveys. The effects of this discharge were also reflected in the increase in ammonia levels from a river background of 0.025 ppm to 0.308 ppm downstream of the outfall.

The specific objective for total coliform of 1,000 organisms/100 ml was generally not exceeded throughout the river. Temporary localized problems in which the objective was exceeded have occurred, however, due to combined sewer overflows or ship pollution.

SUMMARY OF WASTE LOADING

Table 2 presents the waste loading data from both Canadian and U.S. tributary, industrial and municipal sources.

TABLE 2

ST. MARYS RIVER - SUMMARY OF WASTE LOADINGS

(Short Tons per year)

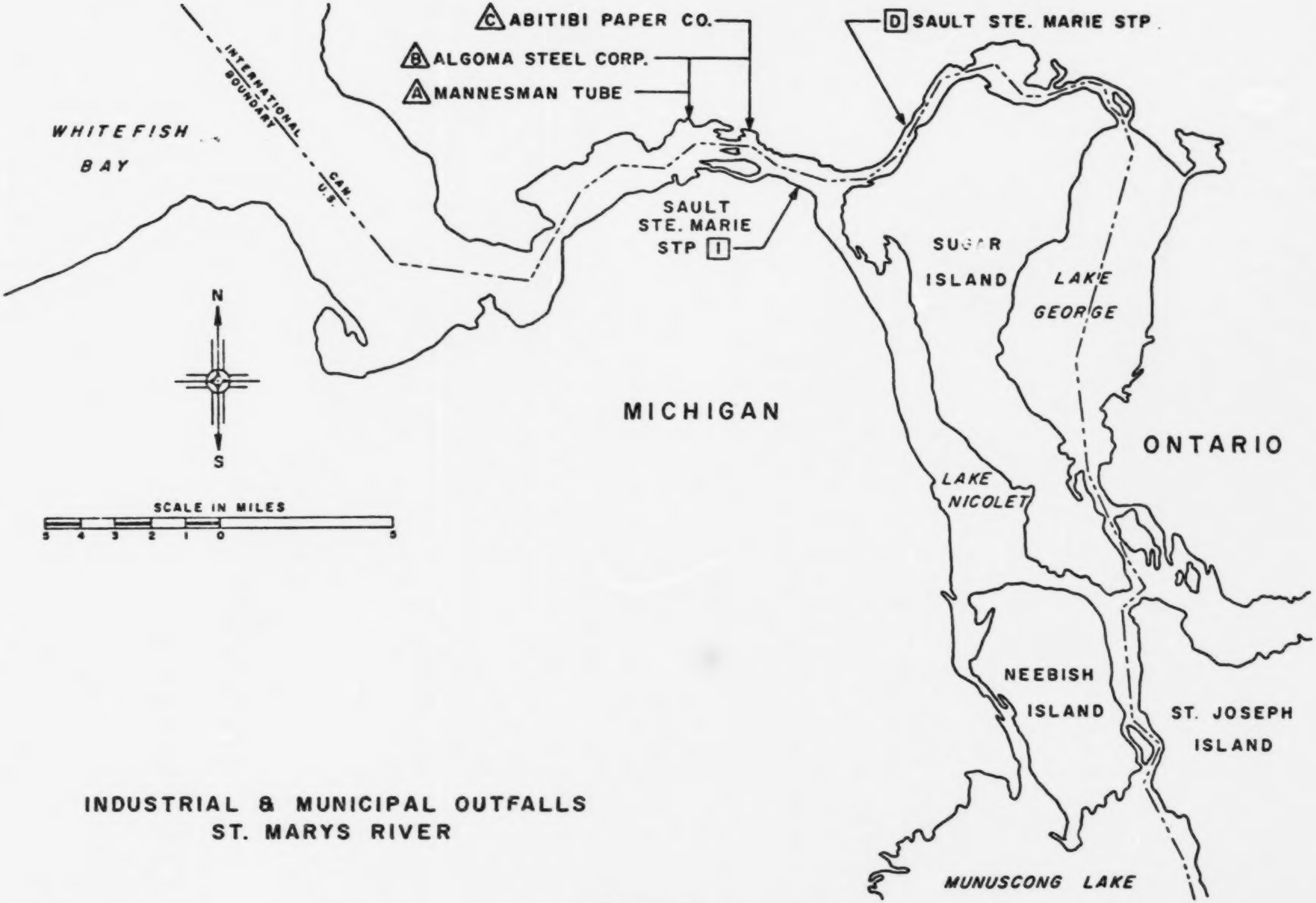
	Flow (cfs)	Total P	BOD_5	TDS	SS	Total N
CANADA						
Tributaries	64	1	45	4,340	380	35
Industrial *	255	19	11,510	23,610	4,760	ND
Municipal	16	85	1,370	4,410	1,120	350
UNITED STATES						
Tributaries	----------NONE----------					
Industrial	----------NONE----------					
Municipal**	5	25	390	ND	240	ND
TOTAL:	340	130	13,315	32,360	6,500	385

* Other Waste Constituents include:

Iron (Fe)	710	(Short tons per year)
Phenol	240	" " " "
Oil	1,790	" " " "
NH_3-N	9,700	" " " "
HCN	760	" " " "

** Data for period June 1971 to June 1972.

ND - No data.



INDUSTRIAL & MUNICIPAL OUTFALLS
ST. MARYS RIVER

Figure 7

LAKE MICHIGAN

WATER QUALITY

Generally the quality of Lake Michigan water is considered to be very good in the open waters and at the Straits of Macinac entrance to Lake Huron where all objectives are met. While Lake Michigan is somewhat more fertile than Lake Superior it has low fertility in regard to trophic status.

In the mid to southern areas of the lake, the biomagnification of DDT and PCB's in salmon, trout and certain other species of fish has prevented their sale in commercial channels. In the near shore waters near Chicago and in Green Bay, odours associated with algal and bacterial growths have required special treatment processes to be employed in the municipal water systems. Algal blooms reach nuisance proportions in lower Green Bay and minor problems of this nature have been experienced along the Michigan shoreline in the vicinity of population centers and major tributaries. Total dissolved solids have slightly exceeded the 200 mg/l objective in five Michigan municipal intakes from St. Joseph to Ludington, but it drops gradually to 125 mg/l as the water enters Lake Huron. Waste discharges along the populated and industrialized shoreline of Indiana cause localized water quality degradation with phosphorus, chlorides, PCB's and possibly certain heavy metals impacting on Lake water quality.

LAKE HURON (INCLUDING GEORGIAN BAY)

WATER QUALITY

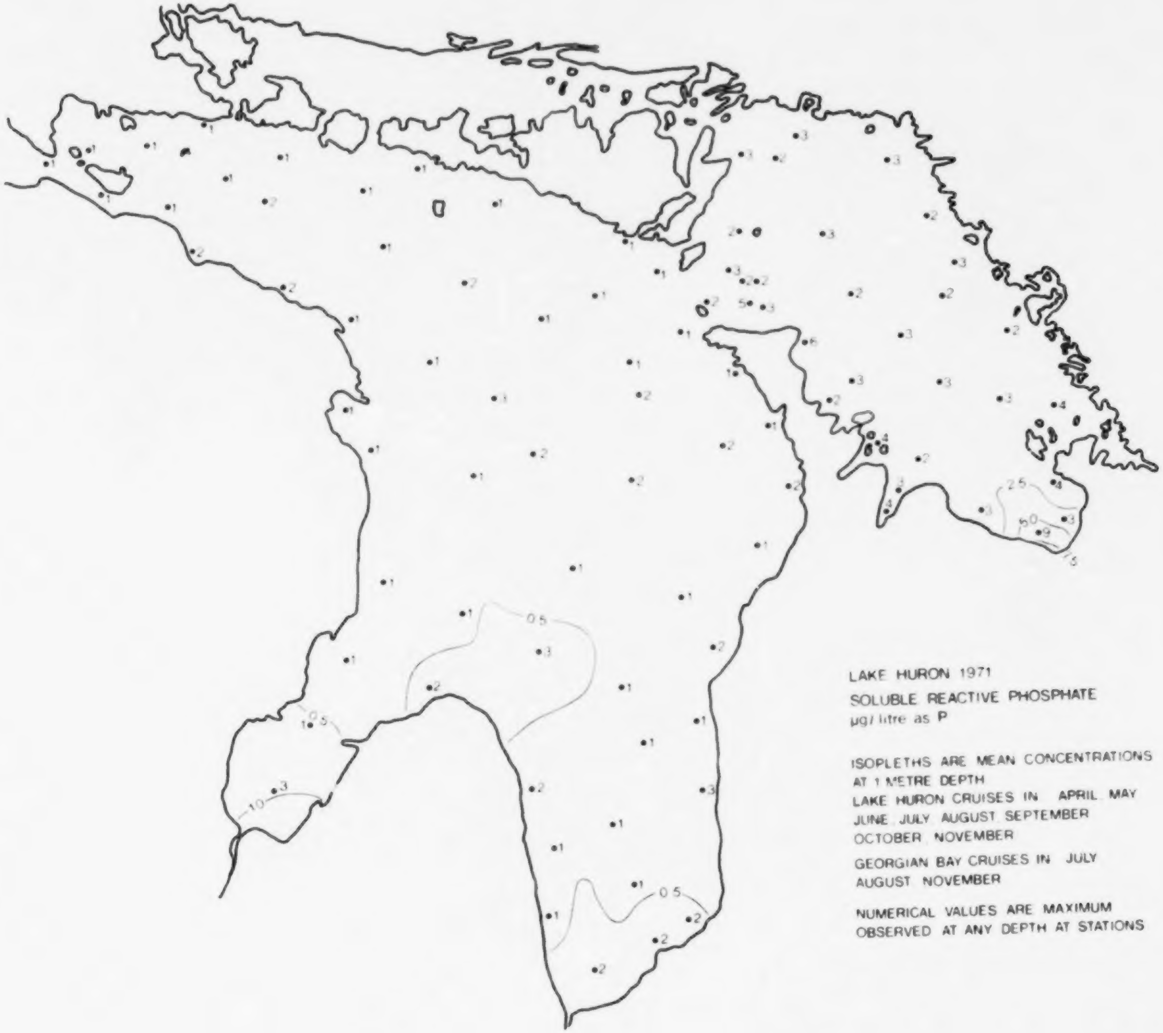
Nutrients

Figures 8 to 10 show the areal distributions of the mean annual soluble reactive phosphate, total phosphorus and inorganic nitrogen concentrations respectively, in the surface waters of Lake Huron. All the distributions were derived from data collected in 1971.

For the most part, the soluble reactive phosphate concentration in Lake Huron remained below 1 μg/l P. The areas where significantly higher concentrations were found was in Saginaw Bay and Southern Georgian Bay. Even here the maximum concentration found in 1971 ranged from 3 - 9 μg/l P. Georgian Bay concentrations of soluble reactive phosphate were generally less than 2 μg/l P, (figure 7).

From the areal distribution of total phosphorus in Figure 9, it can be seen that the concentrations in the surface waters of Lake Huron were generally less than 5 μg/l P with even the maximum values only occasionally greater than 10 μg/l P. There were strong gradients of total phosphorus concentration around Saginaw Bay. A maximum of 90 μg/l P was encountered at one station in the bay during 1971. In Georgian Bay the total phosphorus concentrations were generally less than 5 μg/l (figure 8).

Throughout most of Lake Huron the annual mean inorganic nitrogen concentrations in the surface waters were in the range 200 to 240 μg/l N (figure 10). Saginaw Bay, Thunder Bay and the Straits of Macinac region were the only areas of the lake where the annual mean inorganic nitrogen concentration fell below 200 μg/lN. Maximum concentrations of inorganic nitrogen recorded in 1971 were found in Saginaw Bay in the early spring and along the Canadian shore of the south basin. With the exception of Saginaw Bay the inorganic nitrogen concentrations in the surface waters remained above 150 μg/l N even at the time of maximum depletion in the summer. Mid-lake concentrations remained above 175 μg/l N. In Georgian Bay the inorganic nitrogen ranged from 140 to 200 μg/l N. Because 2/3 of the data used to derive the areal distribution in Figure 9 were collected



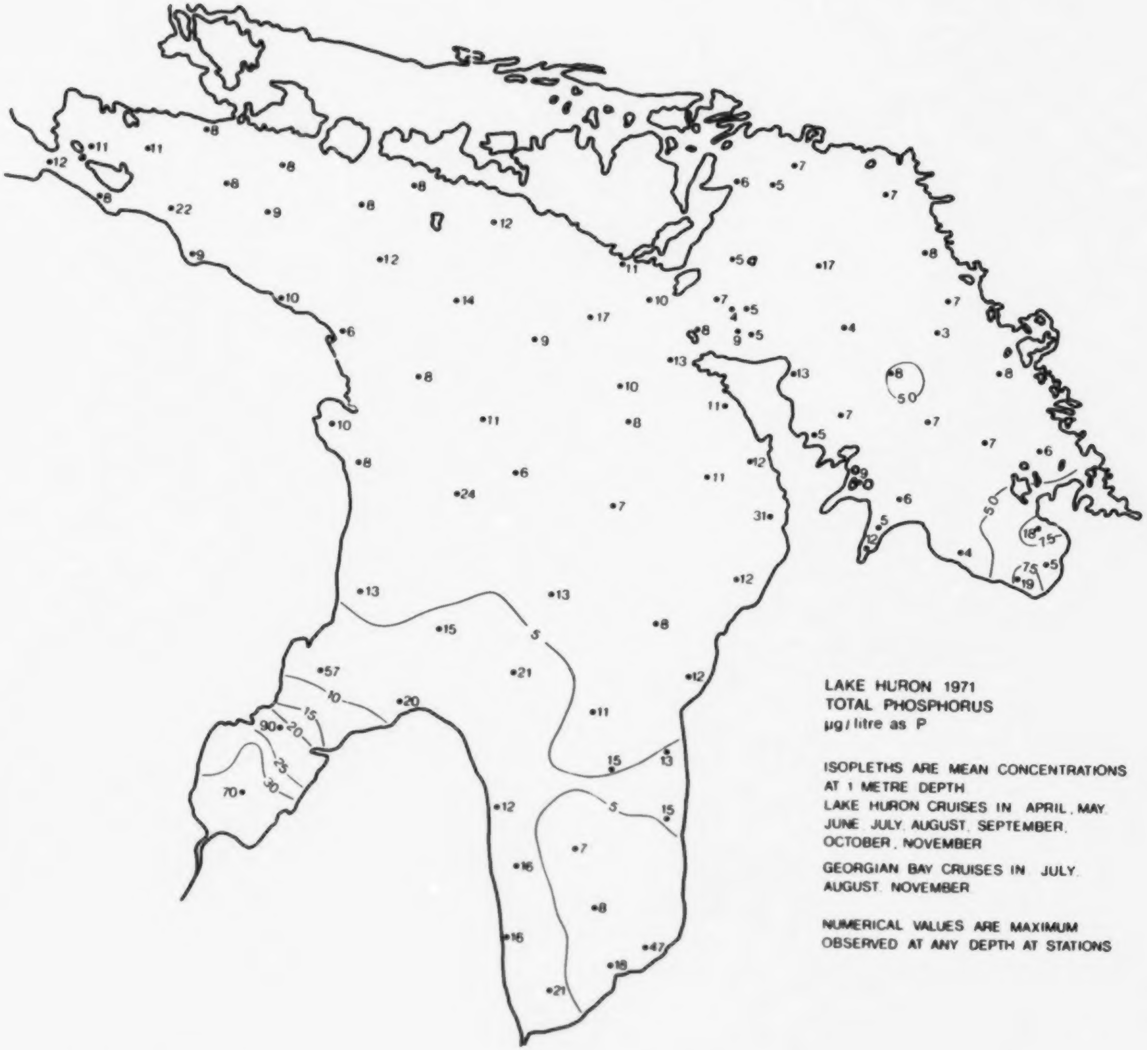
LAKE HURON 1971
SOLUBLE REACTIVE PHOSPHATE
µg/ litre as P

ISOPLETHS ARE MEAN CONCENTRATIONS
AT 1 METRE DEPTH
LAKE HURON CRUISES IN APRIL MAY
JUNE JULY AUGUST SEPTEMBER
OCTOBER NOVEMBER

GEORGIAN BAY CRUISES IN JULY
AUGUST NOVEMBER

NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS

Figure 8

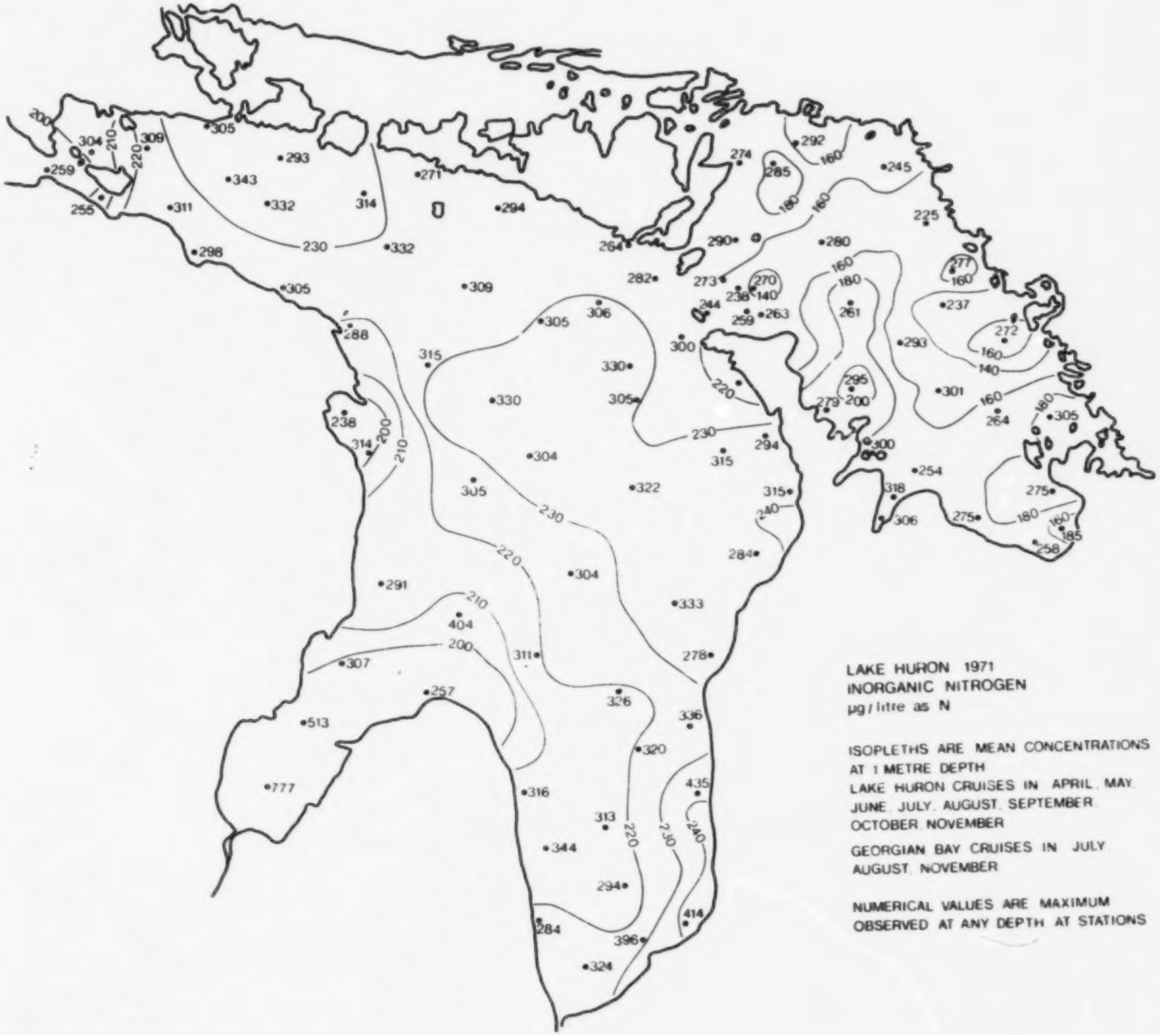


LAKE HURON 1971
TOTAL PHOSPHORUS
µg/litre as P

ISOPLETHS ARE MEAN CONCENTRATIONS AT 1 METRE DEPTH
LAKE HURON CRUISES IN APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER
GEORGIAN BAY CRUISES IN JULY, AUGUST, NOVEMBER

NUMERICAL VALUES ARE MAXIMUM OBSERVED AT ANY DEPTH AT STATIONS

Figure 9

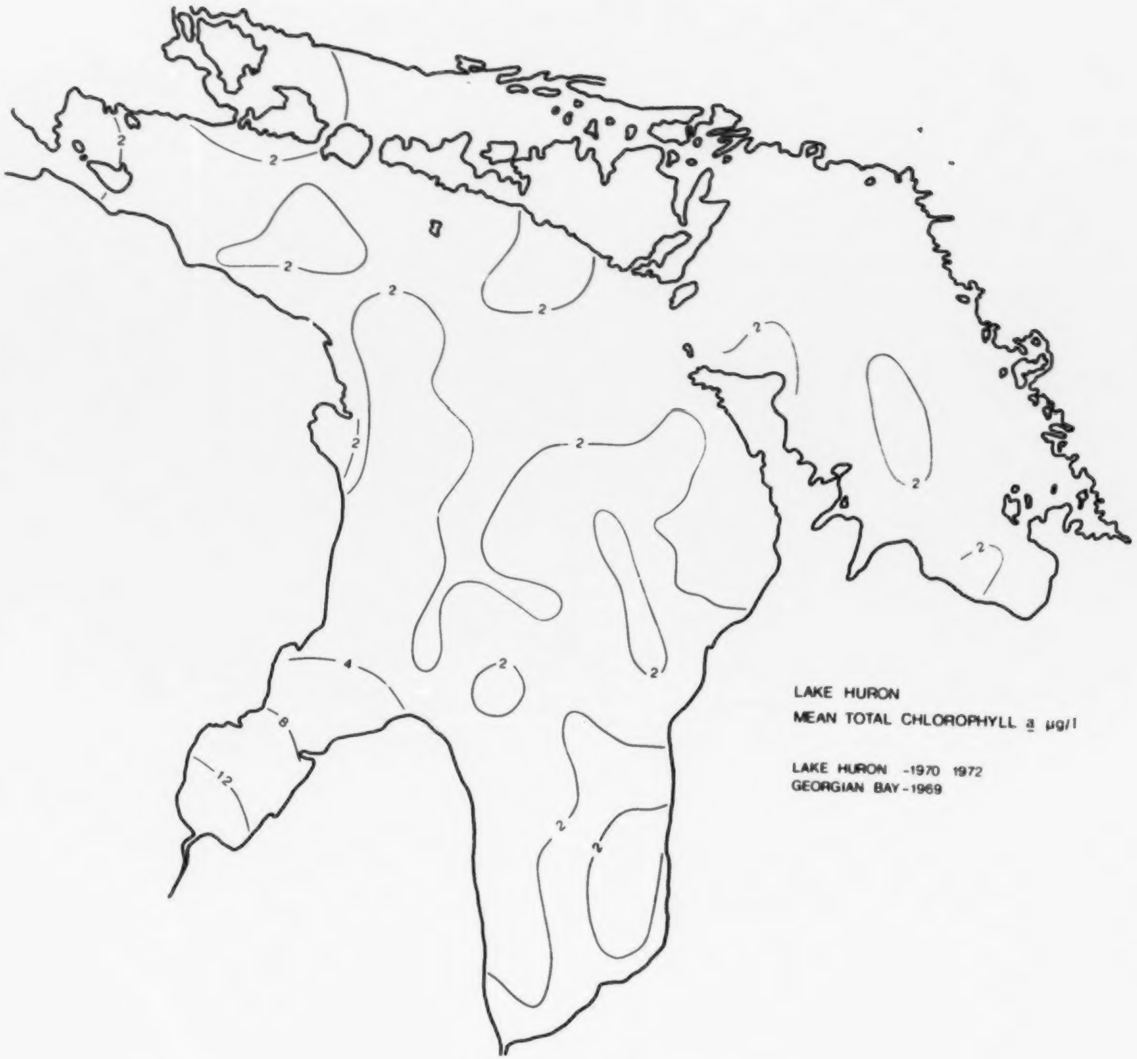


LAKE HURON 1971
INORGANIC NITROGEN
μg/litre as N

ISOPLETHS ARE MEAN CONCENTRATIONS AT 1 METRE DEPTH
LAKE HURON CRUISES IN APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER
GEORGIAN BAY CRUISES IN JULY, AUGUST, NOVEMBER

NUMERICAL VALUES ARE MAXIMUM OBSERVED AT ANY DEPTH AT STATIONS

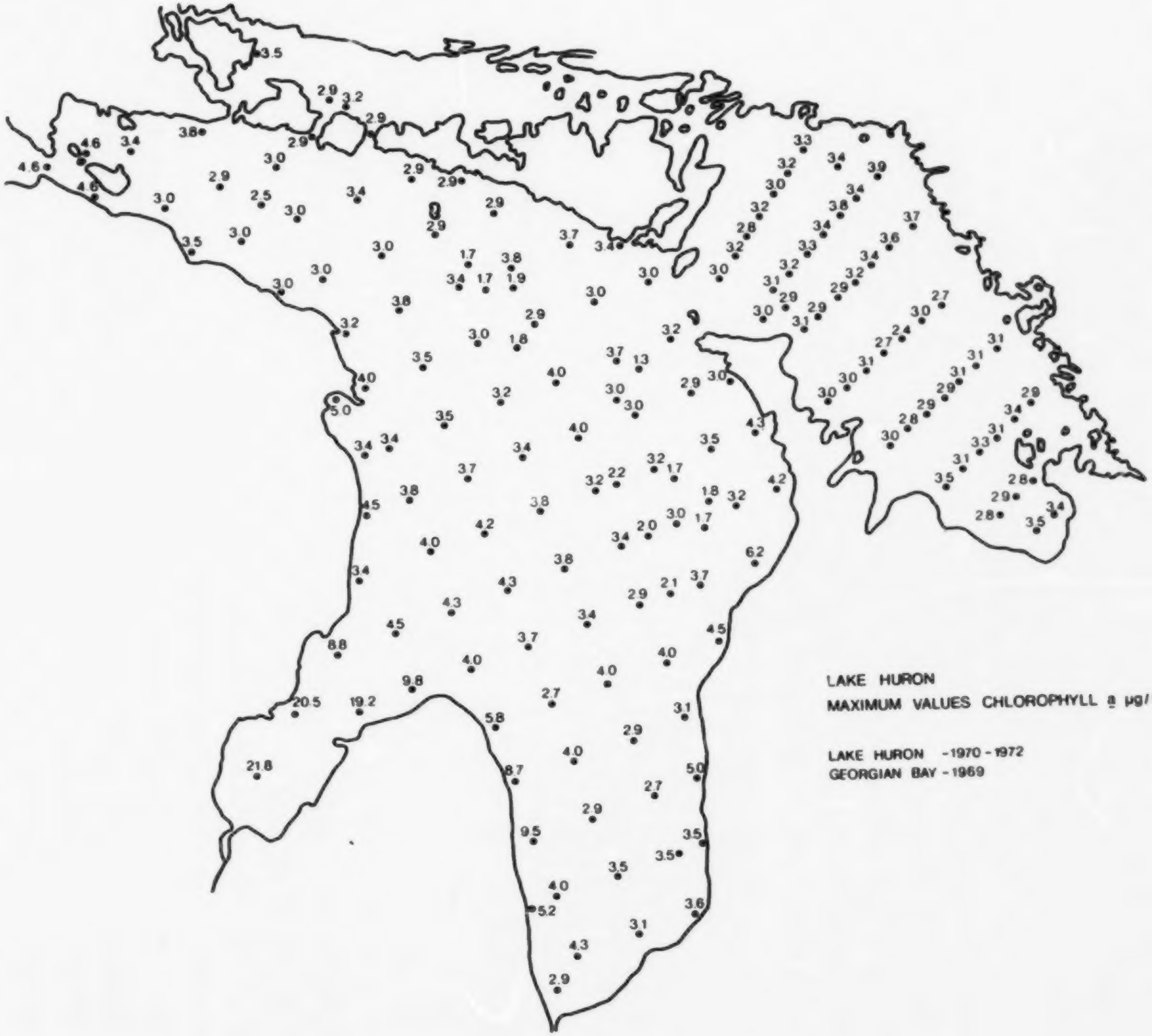
Figure 10



LAKE HURON
MEAN TOTAL CHLOROPHYLL a µg/l

LAKE HURON -1970 1972
GEORGIAN BAY-1969

Figure 11



LAKE HURON
MAXIMUM VALUES CHLOROPHYLL a µg/l

LAKE HURON -1970-1972
GEORGIAN BAY -1969

Figure 12

in the summer when nitrate depletion is greatest, this range is probably lower than the actual annual mean. Maximum recorded inorganic nitrogen-concentration in Georgian Bay occurred in Owen Sound.

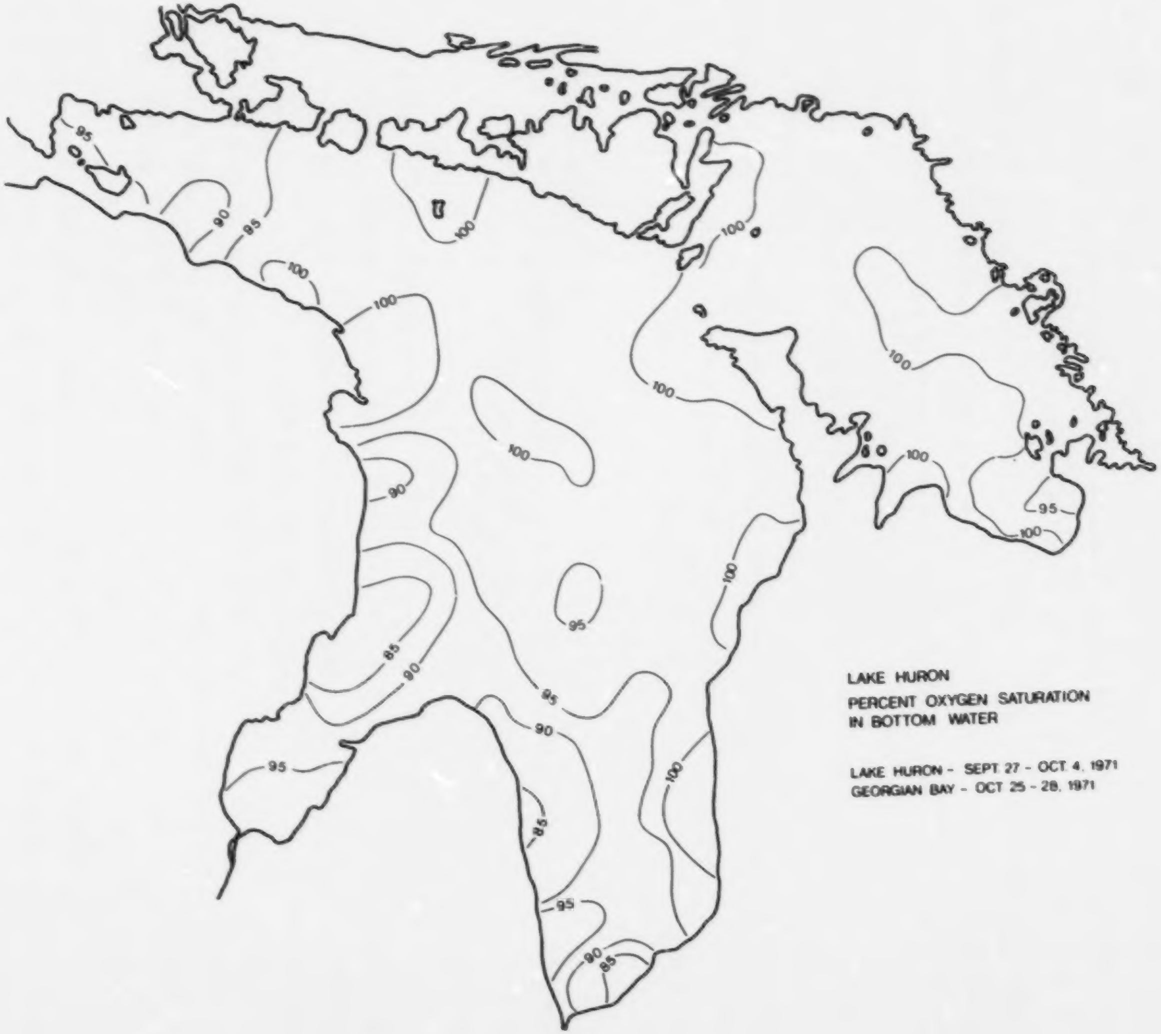
Chlorophyll a

The areal distribution of mean total chlorophyll a in the surface waters of Lake Huron is shown in Figure 11. With the exception of Saginaw Bay, the mean total chlorophyll a concentrations were low, roughly 2 μg/l, with no definite inshore-offshore trends. Saginaw Bay had extremely high gradients of chlorophyll a with means up to 12 μg/l. The maximum recorded values occurred at the head of Saginaw Bay with a high of approximately 22 μg/l. Maxima are also somewhat higher in inshore waters along the Canadian shore south of the Bruce Peninsula, Figure 12.

Dissolved Oxygen

The dissolved oxygen concentration in the upper waters and hypolimnetic waters remained greater than the specific water quality objective of 6 mg/l for upper waters in both Lake Huron and Georgian Bay. At 20°C., which is near the maximum temperature attained by the surface water of the lake, an oxygen concentration of 6 mg/l is equivalent to 68% saturation. The percent oxygen saturation in the upper waters of Lake Huron and Georgian Bay was equal to or greater than 100% throughout the year. The percent oxygen saturation in the bottom waters of Lake Huron at the end of summer stratification is shown in Figure 13. The majority of the lake bottom had oxygen saturation values greater than 90% with only a few areas below 90%. One patch of relatively low percent oxygen saturations, 80-85% was located in the deep water just north of Saginaw Bay with another patch just south of the bay in the 85-90% range. There was also a small area at the south end of the south basin which had oxygen percent saturations between 80-90%.

In the bottom waters the percent oxygen saturations remained above 95% in Georgian Bay, except for one station in the Nottawasaga Bay region which was in the 90-95% saturation range, (Figure 13).



LAKE HURON
PERCENT OXYGEN SATURATION
IN BOTTOM WATER

LAKE HURON - SEPT 27 - OCT 4, 1971
GEORGIAN BAY - OCT 25 - 28, 1971

Figure 13

NEAR-SHORE WATERS

The quality of the waters of Lake Huron and Georgian Bay is generally of a high order. This can be anticipated by the good quality of the near shore waters found in the northern parts of Georgian Bay and the North Channel of Lake Huron, where little development has occurred. Work conducted by the Ontario Water Resources Commission in the late 1950's in assessment of the impact of nitrogen and phosphorus discharges into the shore-waters of Lake Huron provided early evidence that phosphorus was likely an aquatic growth limiting nutrient in Lake Huron.

The high quality of these bodies of water can best be characterized by total coliform counts that are generally well below 50 per 100 ml, turbidity levels usually less than 2.5 standard units, and total phosphorus levels around .02 mg/l. Unexpected phenolic values have been found in the North Channel west of Little Current and these will be kept under review. Generally phenol equivalent values lie at or below the level of detection for phenol.

Michigan's Great Lakes Environmental Contaminants Survey Program recently analyzed 5 whitefish and 5 Menominee whitefish from Lake Huron. All contained low concentrations of the contaminants of concern, DDT, dieldrin, PCB and mercury.

In places where there is expanding development, some impairment of water quality has resulted. This has been seen in such places as Honey Harbor, where there are some elevated bacteriological levels due to inadequately treated private sewage inputs, and Penetang Harbor and Midland Bay where there are elevated levels of phosphorus (believed to be from municipal sources) contributing to enrichment of the area. Penetang Harbor also has elevated levels of coliform bacteria (due to bypass during rainstorms).

Chemical quality of Saginaw Bay exceeds state standards for total dissolved solids and approaches the limits of some other parameters: total coliform, fecal coliform, pH, iron, phosphorus, suspended solids and polychlorbiphenyls.

Michigan's PCB monitoring program in tributaries identified the Saginaw River as a major source of PCB's to Saginaw Bay of Lake Huron.

This was followed up by sampling fish from Saginaw Bay and identifying PCB concentrations higher than FDA guidelines of 5 ppm PCB in channel catfish. The mean PCB values for 10 composite samples of 3 fillets from fish of similar size were 5 ppm in the 15" - 20" class and 9 ppm in the 20" - 25" class. Catfish above 25" averaged 12 ppm PCB.

SPECIFIC AREAS OF NON-COMPLIANCE

The only known exceptions to general water quality objectives in the Michigan portion of Lake Huron are:

(i) PCB levels over the USFDA guideline of 5 ppm in catfish of Saginaw Bay.

(ii) DDT levels over the USDA guidelines of 5 ppm in larger lake trout.

(iii) A sporadic taste and odor problem in the Saginaw-Midland water supply drawn from Saginaw Bay.

(iv) Filamentous algae growths of nuisance proportions immediately south of Harbor Beach and at Sleeper State Park on Saginaw Bay.

Known exceptions to specific water quality objectives are as follows:

	pH	TDS mg/l	Total Fe µg/l
Pinconning Water Works		260	
Bay City Water Works		234	
Port Hope Water Works			320
Bay City State Park Beach, 100' out	8.7	325	
Wagener Co. Park Beach, 50' out	8.8		

· The impairment of the water quality of the southern regions of Georgian Bay is generally the result of expanded shore development and the consequent elevation of bacteriological and nutrient levels. Penetang Harbor and Midland Bay have restricted water movement with Georgian Bay. Increased inputs of nutrients, particularly phosphorus have raised levels of blue-green algae production during late summer periods. Sewage overflows during periods of heavy run-off result in elevated levels of coliform bacteria in the harbor at Penetang.

The uranium mining region of Elliot Lake, drained by the Serpent River, affects the local water quality of Serpent Harbor entering the North Channel where levels of Ra_{226} approximate 3pCi/l.

Tainting of flesh in fish taken from the North Channel adjacent to the Spanish River has been linked to pulp and paper industrial waste effluents discharged upstream to the Spanish River.

At a number of locations on the west shore of the Bruce Peninsula several local water pollution problems caused by discharges from private sewage systems are aggravated during the vacation period in the summer.

The most significant industrial development on the shore of Lake Huron is the nuclear generating complex under development at Douglas Point. This comprises an existing experimental generating station, a heavy water extraction plant and a major nuclear generating station which is not yet operational.

In 1972 an inter-Ministry Task Force on Generating Station Siting was established to provide a review of future siting recommendations of Ontario Hydro thereby ensuring adequate consideration of all environmental aspects related to site selection and operation of generating stations in Ontario. Concerns at Douglas Point centred on the ability to control losses of hydrogen sulphide from the heavy water extraction plant, which uses the gas in an isotope exchange process, and the potential thermal pollution problem. Present indications are that hydrogen sulphide losses can be effectively controlled. Recently, the Ministry approved a cooling water discharge program which is not expected to present a problem.

WASTE LOADING

Table 3 lists the flow data and loading rates of a number of parameters into Lake Huron-Georgian Bay.

The total phosphorus load for the basin is 4,110 tons/year with 68% of the load entering the lake through the tributaries, 6% of the load entering from Lake Michigan and 24% from Lake Superior. The largest tributary loadings were those of the Magnetewan and Saugeen Rivers in the Canadian basin with 463 tons/year and 166 tons/year respectively and the Saginaw River in the U.S. basin with 1246 tons/year.

The Spanish River flowing to the North Channel is by far the most important contributor to the tributary BOD_5 load in the Canadian basin with an annual load of 17,073 tons. The Saginaw River is the largest contributor in the U.S. basin with an annual loading of 24,000 tons.

The total dissolved solids loading to the lake is 20,031,100 tons per year with virtually all of the load entering either through the tributaries or from Lake Michigan and Lake Superior. The tributaries contribute 35% of the total loading with Lake Michigan and Lake Superior contributing 36% and 28% of the total loading respectively. The largest contributors to the tributary load in the Canadian basin are the Saugeen and Maitland Rivers with inputs of 676,300 tons/year and 625,000 tons/year respectively. The Saginaw River, with an annual input of 2,300,000 tons/year is the largest U.S. basin contributor to the tributary load.

The suspended solids loading to the lake is 723,300 tons/year. The bulk of the load, 56% enters the lake via the tributaries. The most important tributaries are the Spanish River in the Canadian basin and the Saginaw River in the U.S. basin, with inputs of 68,300 tons/year and 83,402 tons/year, respectively.

The total nitrogen loading to the lake is 61,900 tons/year, exclusive of U.S. tributary inputs. Lake Superior and Lake Michigan contribute about equally to this load, about 35% of the total each. The Canadian tributaries contribute the bulk of the remainder.

TABLE 3

LAKE HURON-GEORGIAN BAY - SUMMARY OF WASTE LOADINGS

(Short tons per year)

	Flow (cfs)	Total P	BOD_5	TDS	SS	Total N**
CANADA						
Tributaries	27,120	1,259	45,350	3,508,500	266,500	18,600
Industrial	*	1	700	500	*	*
Municipal	20	85	1,100	7,100	900	200
UNITED STATES						
Tributaries	10,280	1,531	35,300	3,585,600	137,700	nd
Industrial	170	nd	11,900	14,200	2,000	nd
Municipal	5	4	200	14,200	200	nd
SUB TOTAL:	37,595	2,880	94,550	7,131,100	407,300	18,800
Input Lake Superior (includes St. Mary's River)	99,000	975	58,500	5,600,000	146,000	21,400
Input Lake Michigan	52,000	255	76,800	7,300,000	170,000	21,700
TOTAL:	188,595	4,110	229,850	20,031,100	723,300	61,900

* - Negligible

** - Incomplete data

nd - No Data

ST. CLAIR RIVER

The St. Clair River receives municipal waste discharges from six sources in the United States; five are primary and one is untreated. On the Canadian side, three sewage treatment plants, two of which are primary, discharge into the river.

A total of four industrial manufacturing plants and two electric power generation plants discharge into the United States side of the river. The four industrial plants are involved in chemical manufacturing, paper products manufacturing and metal plating.

WATER QUALITY CONDITIONS AND AREAS OF NON-COMPLIANCE

Although good quality water with very little wasteload enters the St. Clair River from Lake Huron, the river gradually acquires a wasteload contributed by municipal wastewater treatment plants and industries that line both shorelines as located on figure 14. Other contributing sources are the tributary streams such as the Black, Pine and Beele Rivers on the U.S. side and Talford, Baby and Clay creeks on the Canadian side. Stormwater run-off periodically contributes to the loading as does ship pollution.

In general, the St. Clair River water quality for 1972 was comparable to that of 1971. Except for isolated instances along both shorelines, where the specific objective for total coliforms of 1000 organisms/ 100 ml was exceeded, all ranges had coliform levels that conformed with this objective.

A brownish scum and oil sheen has been observed downstream from the Petrochemical Industrial complex at Sarnia, extending 500' offshore along the Canadian shoreline as far as Corunna.

Some problem areas were encountered where phenol concentrations did not conform to the objectives, reaching 7 ppb along the Canadian shore. The average phenol concentration in the water was approximately 2 ppb.

Oil problems were generally the same in 1972 as in previous years. The Sarnia industrial area on the Canadian side of the river continued to be a source of oil and chemical spills.

Mercury investigations continued in the St. Clair River and Lake St. Clair. Although the concentration of mercury in water samples taken from the St. Clair - Detroit River system was less than the detectable level, concentrations as high as 1.5 mg/l were found in various species of fish, exceeding the 0.5 mg/l guideline for food consumption.

SUMMARY OF WASTE LOADINGS

Table 4 presents the waste loading summary for both U.S. and Canadian tributary, industrial and municipal sources.

TABLE 4

ST. CLAIR RIVER - SUMMARY OF WASTE LOADINGS

(Short tons per year)

	Flow (cfs)	Total P	BOD_5	TDS	SS	Total N
CANADA						
Tributaries	-------------------	-NONE-	-------------------	-------------------	-------------------	-------------------
Industrial**	2,280	70	16,025	380,380	13,550	ND
Municipal**	15	55	670	5,345	655	315
UNITED STATES						
Tributaries	175	20	555	56,550	3,060	ND
Industrial	590	ND	865	ND	10,755	ND
Municipal	25	140	1,370	ND	1,640	ND
TOTAL:	3,085	285*	19,485	442,275*	29,660	315*

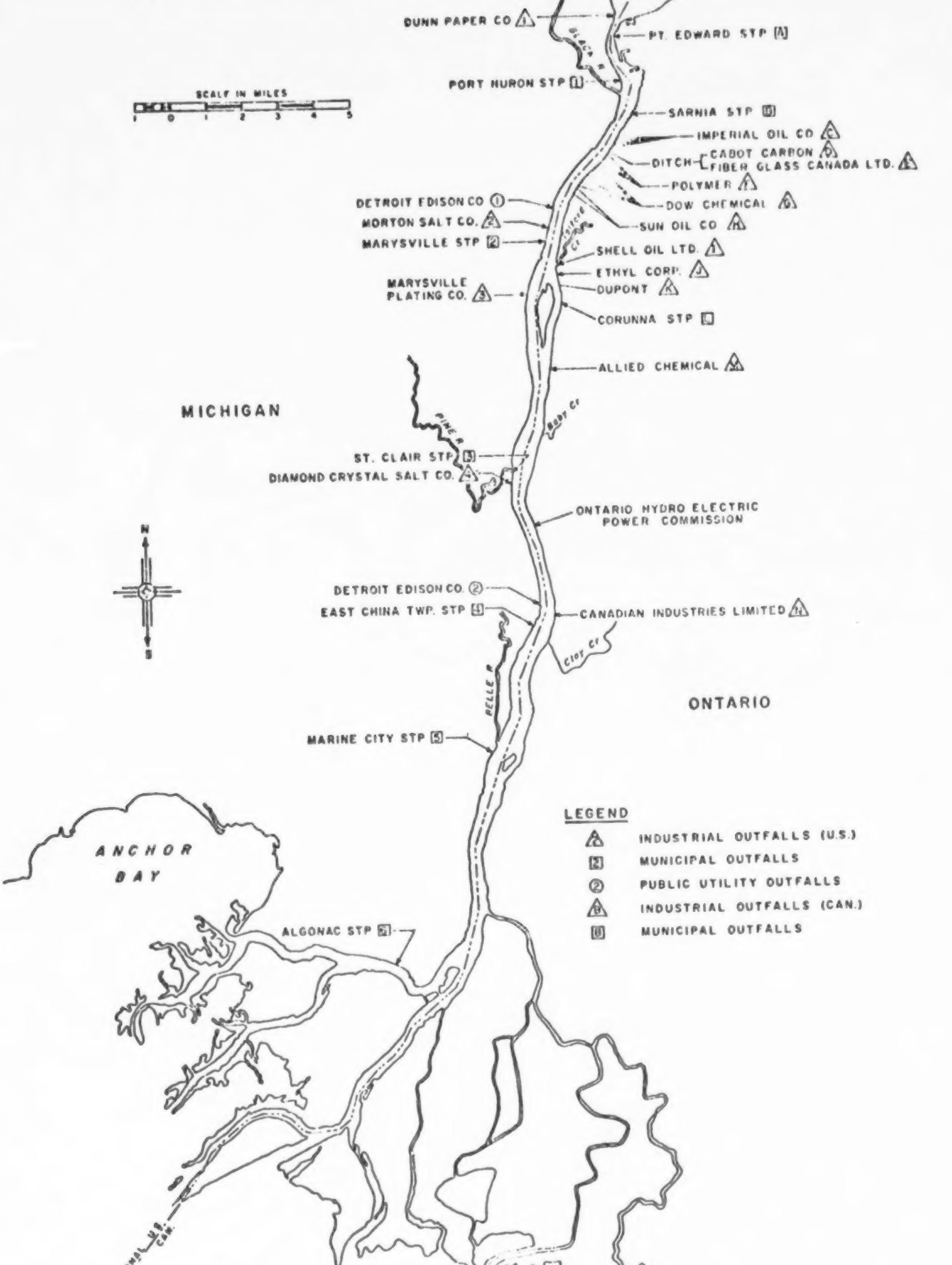
* - Incomplete information.

** - Other waste loads include: Iron (Fe) - 295 (short tons per year)
Phenol - 110 "

ND - No data.

Figure 14

INDUSTRIAL & MUNICIPAL OUTFALLS
ST. CLAIR RIVER



LAKE ST. CLAIR

WATER QUALITY

There are no large commercial or industrial communities or large vessel harbours situated around its shores. Its main inflowing tributaries are the St. Clair and the Thames Rivers.

The only known exceptions to the water quality objectives were the occurrence of mercury associated with bottom deposits which contribute to unacceptable levels in fish. Excessive coliform counts along the shoreline from combined sewage and storm overflows and water runoff is the cause of periodic water quality degradation.

Algae blooms (total counts of green and blue-greens ranging from 1500 - 4300 cells/ml) are often encountered.

SUMMARY OF WASTE LOADING

Table 5 lists total waste loads to Lake St. Clair.

TABLE 5

LAKE ST. CLAIR - SUMMARY OF WASTE LOADINGS

	Flow (cfs)	Total P	BOD_5	TDS	SS
CANADA					
Tributaries*	2,239	540	9,125	707,200	ND
Industrial	NONE				
Municipal	NONE				
UNITED STATES					
Tributaries	390	140	1,850	103,950	6,515
Industrial	1	ND	ND	ND	ND
Municipal	NONE				
SUB TOTAL	2,630	680	10,975	811,150	6,515
Input - Lake Huron including St. Clair River	209,400	2,890	186,000	28,000,000	1,440,000
TOTAL:	215,115	3,570	196,975	28,811,150	1,446,515

* Other Waste Loads include:

Iron (Fe)	2,930	short tons per year
Nitrogen (Total N)**	6,440	" " " "
Chloride (Cl)	6,384	" " " "

ND - No data.

** - Incomplete data.

DETROIT RIVER

WATER QUALITY AND AREAS OF NON-COMPLIANCE

The upper ten miles of the Detroit River, generally conformed to the water quality objectives; however, at its confluence with Lake Erie, its water quality as evidenced by levels of phosphorus, phenols, iron and coliform values, indicates considerable deterioration. Figures 15 and 16 show the location of waste outfalls.

Phosphorus values of 0.14 and 0.17 mg/l were found on the U.S. side of the river downstream of the Rouge River and near the inflow to Lake Erie. Both values are lower than those recorded in the same regions during 1971.

Immediately above the Rouge River, high coliform concentrations (fecal coliform concentrations as high as 300 - 600 organisms/100 ml; total coliform concentrations 8,000 organisms/100 ml) are found along both shores. These conditions were also noted at the mouth of the river. Along the U.S. Shore, in the upper part of the river, high coliform concentrations are the result of combined sewer overflows that occur periodically; along the Canadian shore at Windsor, significant coliform concentrations are probably the result of periodic overflows of inadequately treated sewage.

Below the Detroit sewage treatment plant outfalls, which accounts for about 80% of the total municipal load to the river, sanitary and industrial waste discharges result in objectives being exceeded down to the mouth of the river. Phenols, iron and coliform exceed the specific objectives.

Iron values exceed the specific objectives throughout the river and increase downstream from the mouth of the Rouge River.

SUMMARY OF WASTE LOADING

Table 6 represents in tabular form a summary of the waste loading input from U.S. and Canadian tributary, industrial and municipal sources.

TABLE 6

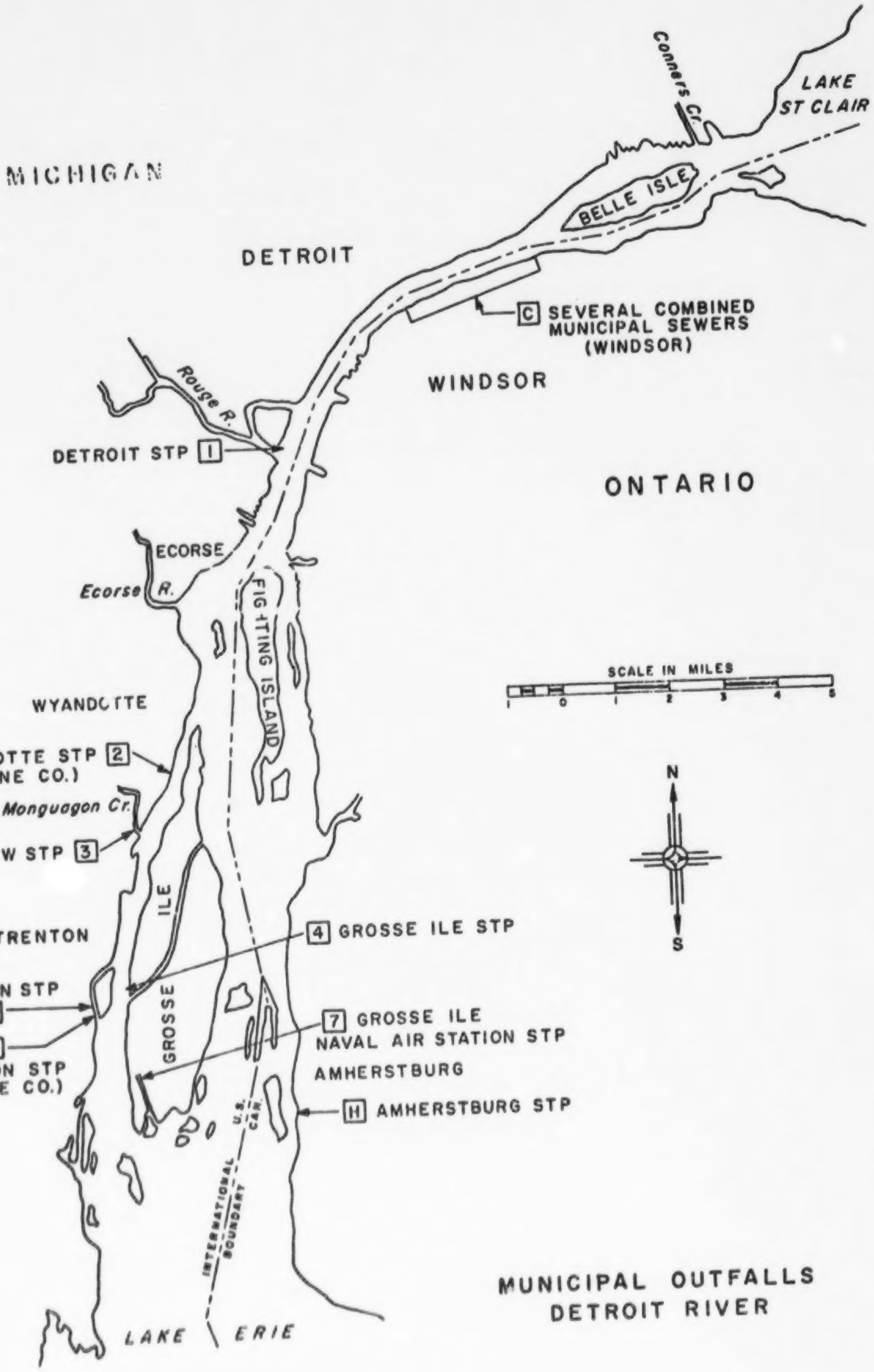
DETROIT RIVER - SUMMARY OF WASTE LOADINGS

(Short tons per year)

	Flow (cfs)	Total P	BOD_5	TDS	SS	Total N
CANADA						
Tributaries	------------------------NONE---------------------------					
Industrial	175	15	560	209,350	4,090	ND
Municipal	50	255	3,445	20,330	3,080	880
UNITED STATES						
Tributaries	110	10	265	20,500	1,885	ND
Industrial	4,870	90	ND	ND	130,380	ND
Municipal	1,260	6,900	35,445	ND	168,320	ND
TOTAL:	6,456	7,270	39,715*	250,180*	307,755	880*

* - Incomplete information.

ND - No data.



MUNICIPAL OUTFALLS
DETROIT RIVER

Figure 15

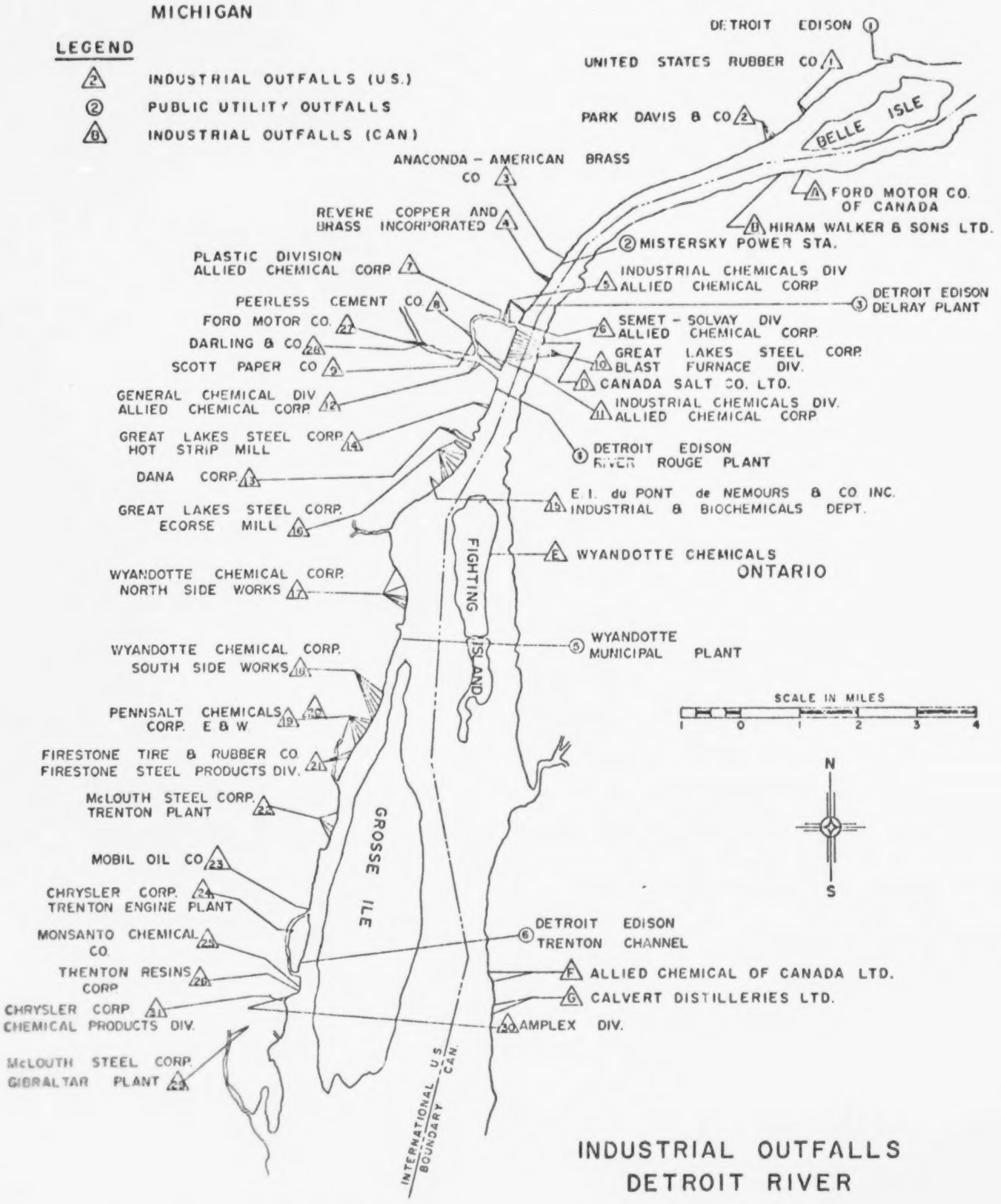

MICHIGAN
LEGEND
2 INDUSTRIAL OUTFALLS (U.S.)
② PUBLIC UTILITY OUTFALLS
B INDUSTRIAL OUTFALLS (CAN)
DETROIT EDISON ①
UNITED STATES RUBBER CO 1
PARK DAVIS & CO 2
BELLE ISLE
ANACONDA - AMERICAN BRASS CO 3
REVERE COPPER AND BRASS INCORPORATED 4
A FORD MOTOR CO. OF CANADA
B HIRAM WALKER & SONS LTD.
② MISTERSKY POWER STA.
PLASTIC DIVISION ALLIED CHEMICAL CORP 7
5 INDUSTRIAL CHEMICALS DIV ALLIED CHEMICAL CORP
PEERLESS CEMENT CO 8
③ DETROIT EDISON DELRAY PLANT
FORD MOTOR CO. 27
6 SEMET - SOLVAY DIV ALLIED CHEMICAL CORP
DARLING & CO 28
10 GREAT LAKES STEEL CORP BLAST FURNACE DIV.
SCOTT PAPER CO 9
D CANADA SALT CO. LTD.
GENERAL CHEMICAL DIV ALLIED CHEMICAL CORP 12
11 INDUSTRIAL CHEMICALS DIV. ALLIED CHEMICAL CORP
GREAT LAKES STEEL CORP HOT STRIP MILL 14
④ DETROIT EDISON RIVER ROUGE PLANT
DANA CORP 13
15 E. I. du PONT de NEMOURS & CO INC. INDUSTRIAL & BIOCHEMICALS DEPT.
GREAT LAKES STEEL CORP. ECORSE MILL 16
FIGHTING ISLAND
E WYANDOTTE CHEMICALS
ONTARIO
WYANDOTTE CHEMICAL CORP NORTH SIDE WORKS 17
⑤ WYANDOTTE MUNICIPAL PLANT
WYANDOTTE CHEMICAL CORP. SOUTH SIDE WORKS 18
SCALE IN MILES
1 0 1 2 3 4
PENNSALT CHEMICALS CORP. E & W 19 20
FIRESTONE TIRE & RUBBER CO. FIRESTONE STEEL PRODUCTS DIV. 21
N
McLOUTH STEEL CORP. TRENTON PLANT 22
GROSSE ILE
MOBIL OIL CO 23
S
CHRYSLER CORP. TRENTON ENGINE PLANT 24
⑥ DETROIT EDISON TRENTON CHANNEL
MONSANTO CHEMICAL CO. 25
TRENTON RESINS CORP 26
F ALLIED CHEMICAL OF CANADA LTD.
G CALVERT DISTILLERIES LTD.
CHRYSLER CORP CHEMICAL PRODUCTS DIV. 31
30 AMPLEX DIV.
McLOUTH STEEL CORP. GIBRALTAR PLANT 29
INTERNATIONAL BOUNDARY
U.S. CAN.
INDUSTRIAL OUTFALLS
DETROIT RIVER

Figure 16

LAKE ERIE

WATER QUALITY

General

Since 90% of the inflow of Lake Erie is from the Detroit River the off-shore lake quality is substantially that of the mid-channel of the river. In contrast the near shore water quality, and particularly the southern shore, is strongly influenced by the quality of tributaries and direct discharges of waste waters. The most significant effects of these discharges on the near shore water quality are higher concentrations of dissolved solids, turbidity, nutrients as well as higher densities of bacteria and algae.

Nutrients - Total Phosphorus

Figure 17 shows the mean concentrations at the 5 metre depth averaged over 10 cruises during 1970. Maximum values observed at stations are also entered. Six epilimnion concentration maps weighted by volume for May to September, 1970 have been examined and they show a surprisingly consistent pattern.

Each of the three basins has different areal phosphorus distributions, that correlate very closely with dominant current patterns. The western basin has a marked west to east decrease in concentration of total P ranging from 50 µg/l to 30 µg/l. The eastern basin has a slight west to east increase. In general,distribution patterns are directly related to the sources of high phosphorus inflow, principally the mouth of the Detroit River and in the vicinity of Cleveland, Ohio and are controlled by dominant current patterns.

Soluble Reactive Phosphate

The soluble reactive P pattern as shown in Figure 18 is very similar to the total P pattern of Figure 17. The individual contour maps generally have a pattern similar to the annual mean map but the degree of variability between maps is greater than in the case of total P. The large input from Cleveland is obvious but to what extent the high values on the south shore of the central basin are due to Cleveland input and to what extent to the general circulation through the lake taking place predominantly along the southern shore is not clear.

In the western basin the concentration gradient extends west to east with mean values ranging from 11 to 3 μg/l, in the central basin the gradient is south to north and varies from 6 to 1 μg/l.

Soluble Inorganic Nitrogen

The soluble inorganic nitrogen pattern as shown in Figure 19 is similar to the soluble phosphorus pattern (Figure 18) with the exception that the maximum concentrations (up to 970 μg/l) are in the region affected by the Sandusky River outflow and this shows consistently in the cruise contour maps. Again, it is difficult to say whether the high south shore values in the eastern basin are due to loadings along the south shore or due to the flow through the lake occurring predominantly along the south shore. Upwellings of bottom water during the period of epilimnion depletion is also a factor in the near surface nitrogen distribution.

Mean values for the western basin generally decrease in an easterly direction from 300 μg/l to 200 μg/l. In the Central basin the mean values generally increase in a north to south direction from 50 to 250 μg/l. A mean value of 100 μg/l is noted in the eastern basin.

Chlorophyll *a*

Figure 20 shows the mean total chlorophyll *a* values for the period 1970 - 1972 and Figure 21 the maximum values for the same period. The mean values for chlorophyll *a* follow similar distribution patterns as those for soluble reactive phosphorus and total nitrogen. The means generally reflect the influence of domestic and industrial discharges. Higher values greater than 9 μg/l, occur along the U.S. shore near Erie, Pennsylvania; Cleveland, Ohio; and in the western basin of Lake Erie where means up to 15 μg/l occur. Lowest mean values (4 μg/l) are found along the

Canadian waters of the Central basin and in the eastern basin. In general, the western basin has roughly three times the algal standing crop as the other two basins.

Distribution of maximum chlorophyll values confirm the above mentioned pattern. Maxima greater than 14 μg/l characterize U.S. inshore Central basin waters with peaks up to 39 μg/l in the western basin. The lowest maxima occur generally in the eastern basin.

Dissolved Oxygen

It is difficult to make a generalized statement on oxygen conditions in Lake Erie as they are highly variable, the main factors controlling the variability being the basin depth and intensity of wind induced mixing. It is because of this variability that a number of hypolimnion oxygen maps are presented in Figures 22, 23, and 24.

During the summer period of 1970, there were very few strong winds of long duration and this calm condition caused very little resupply of oxygen to the bottom waters of the Central basin with the resulting high depletion rate. Thus in 1970, large areas of the bottom waters of the Central basin were anoxic in August and September, whereas in the eastern basin oxygen levels were greater than 60% saturation. One high wind period just prior to the August 1971 monitor caused a drastic change of the oxygen picture, due to resupply of oxygen to the hypolimnion as surface waters were mixed downwards. The temperature at one station in the hypolimnion was 15.4°C with an oxygen concentration of 78% saturation, while at a nearby station the temperature of the water was 11.5°C, with an oxygen concentration of 7% saturation. This also illustrates the probability that there were locations of extremely low oxygen concentrations before the wind caused mixing. Again in 1972 there is evidence of pronounced mixing downwards of surface waters and redistribution of hypolimnion waters. However, the 1972 data do show very low values for oxygen in the eastern basin - low enough for serious concern.

It is not possible to state whether the calmer conditions of 1970 or the more mixed conditions of 1971 or 1972 are the more prevalent.

Figure 22 is a map of hypolimnion conditions only and illustrates

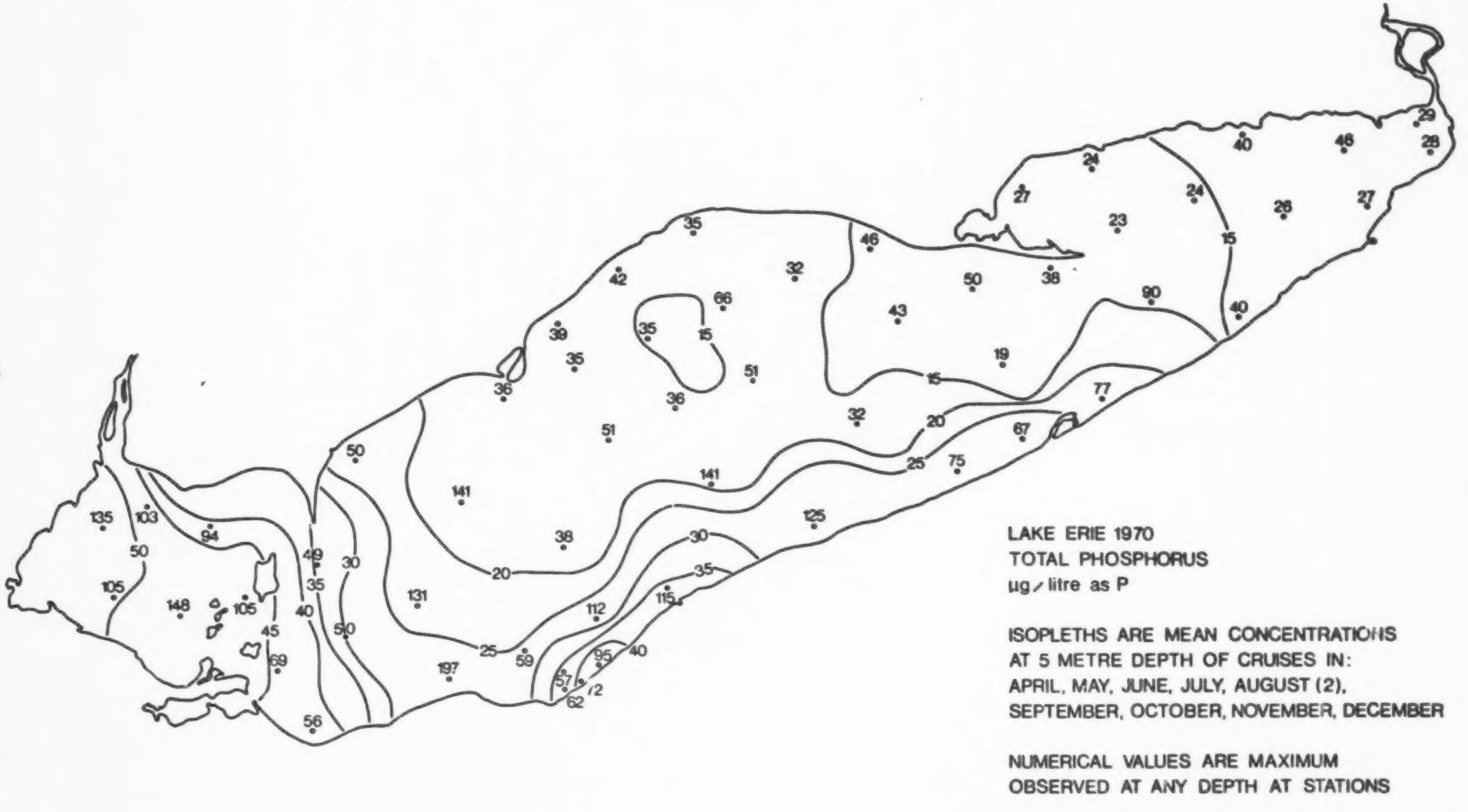
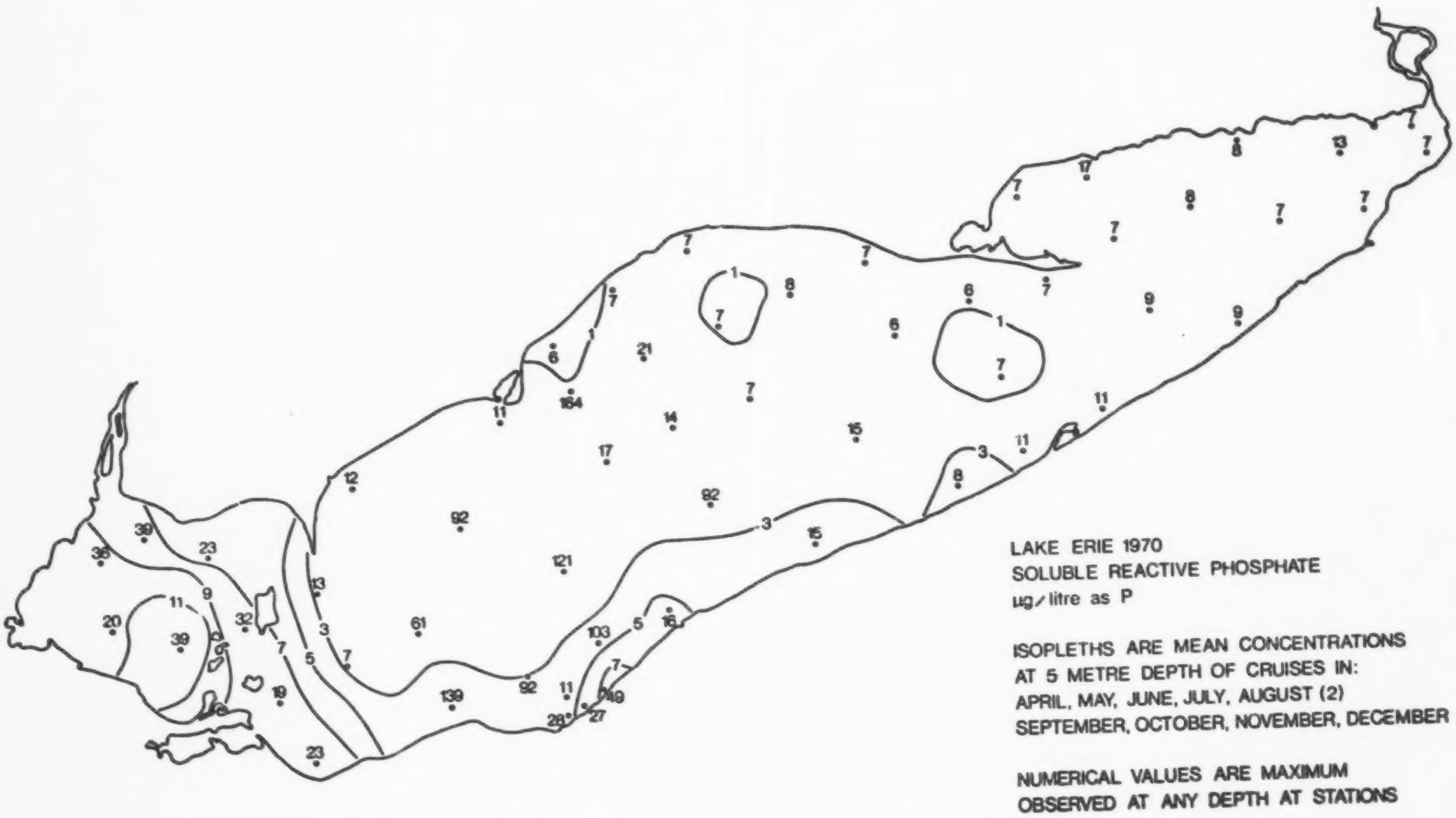

LAKE ERIE 1970
TOTAL PHOSPHORUS
µg / litre as P
ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
APRIL, MAY, JUNE, JULY, AUGUST (2),
SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS
135
103
94
50
105
148
105
45
69
56
49
35
40
30
50
50
131
141
197
25
20
38
59
57
62
72
95
40
112
115
35
30
125
141
51
36
36
39
35
42
35
35
15
66
51
32
32
46
43
50
38
19
15
20
25
75
67
77
90
40
27
24
23
24
15
40
26
46
27
29
28

Figure 17



LAKE ERIE 1970
SOLUBLE REACTIVE PHOSPHATE
ug/litre as P

ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
APRIL, MAY, JUNE, JULY, AUGUST (2)
SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER

NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS

Figure 18

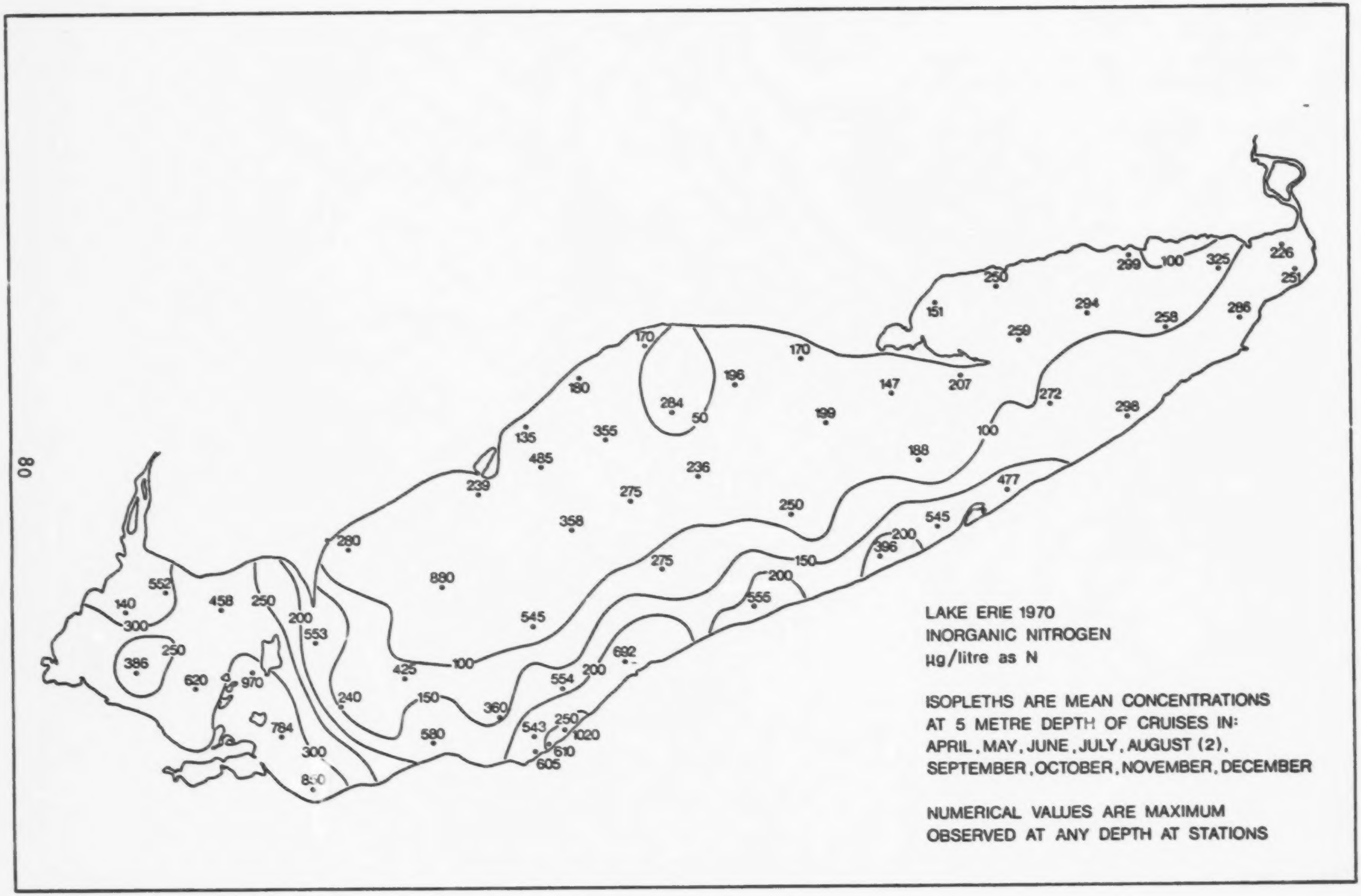
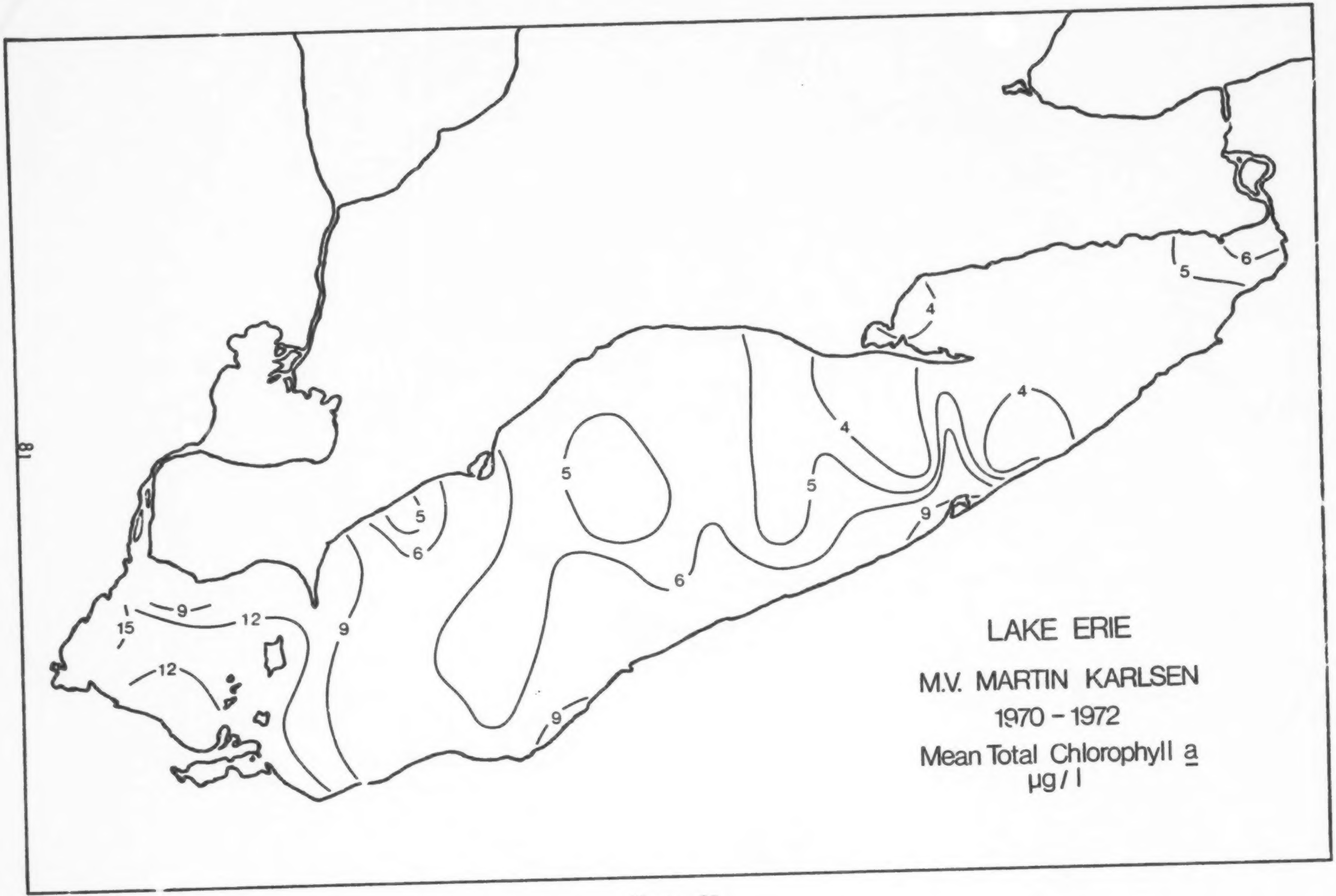

LAKE ERIE 1970
INORGANIC NITROGEN
μg/litre as N
ISOPLETHS ARE MEAN CONCENTRATIONS
AT 5 METRE DEPTH OF CRUISES IN:
APRIL, MAY, JUNE, JULY, AUGUST (2),
SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS
226
251
299
100
325
250
286
294
258
151
259
272
298
170
170
196
147
207
180
284
50
199
100
188
135
355
485
236
477
239
275
250
545
358
200
396
280
275
150
200
880
555
552
140
458
250
200
553
545
300
250
386
425
100
692
620
970
240
554
200
150
360
784
580
543
250
1020
610
300
605
850

Figure 19



LAKE ERIE

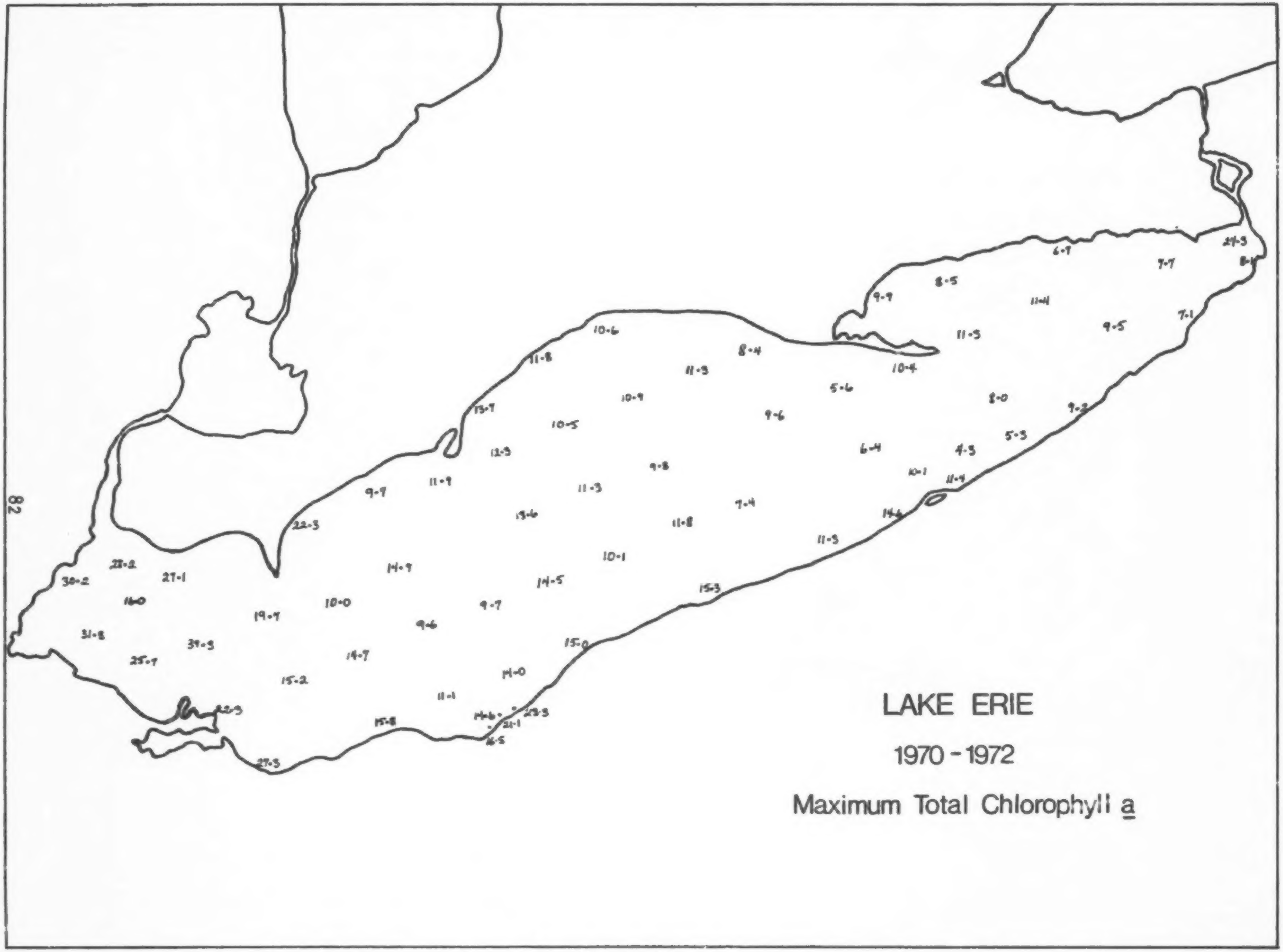
M.V. MARTIN KARLSEN

1970 - 1972

Mean Total Chlorophyll a

µg/l

Figure 20

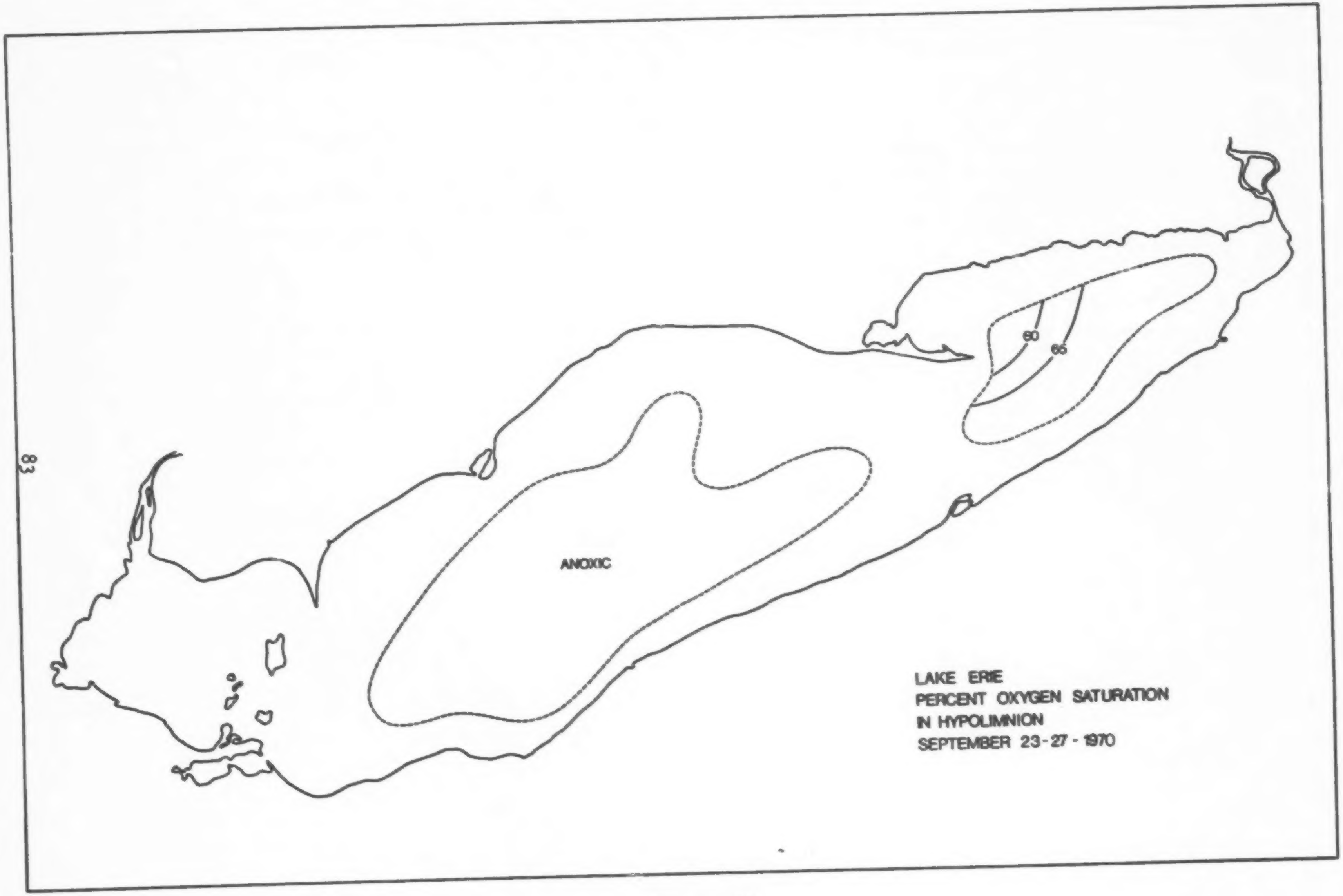


LAKE ERIE

1970 - 1972

Maximum Total Chlorophyll a

Figure 21



LAKE ERIE
PERCENT OXYGEN SATURATION
IN HYPOLIMNION
SEPTEMBER 23-27-1970

Figure 22

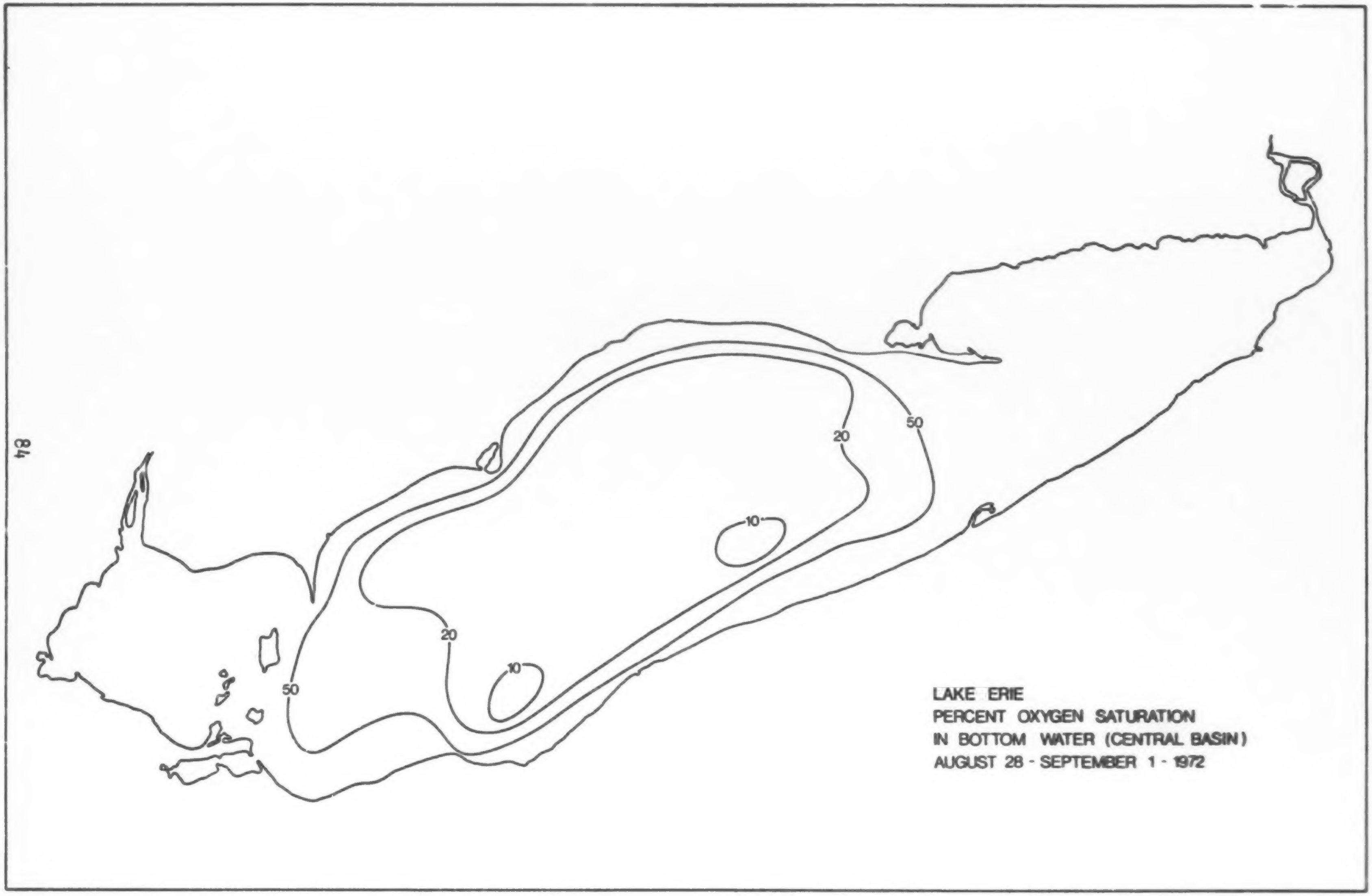
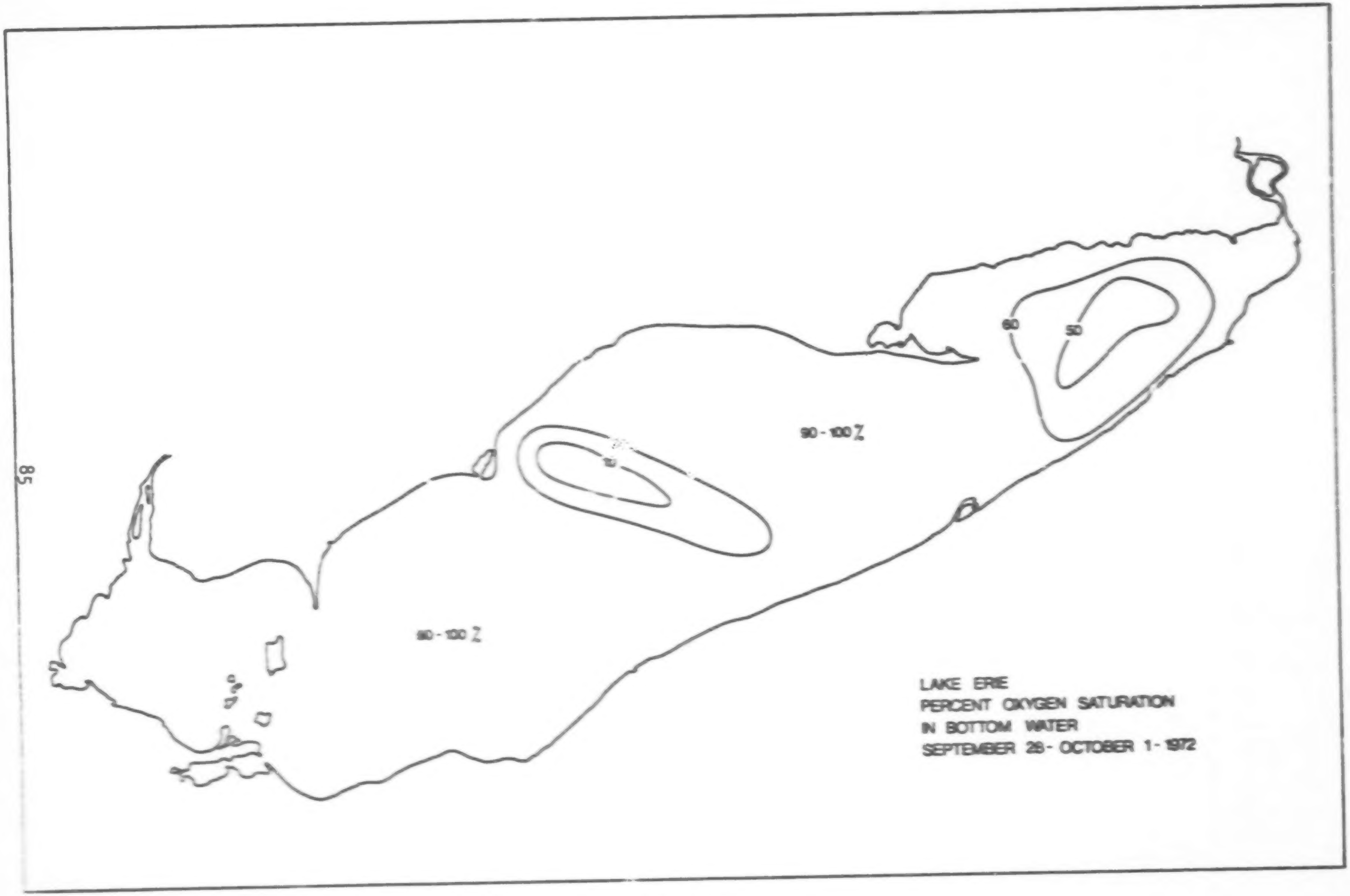

LAKE ERIE
PERCENT OXYGEN SATURATION
IN BOTTOM WATER (CENTRAL BASIN)
AUGUST 28 - SEPTEMBER 1 - 1972

Figure 23



LAKE ERIE
PERCENT OXYGEN SATURATION
IN BOTTOM WATER
SEPTEMBER 28 - OCTOBER 1 - 1972

Figure 24

the degree of hypolimnion oxygen depletion in late 1971. Figure 24 is a map of oxygen depletion at the bottom over the lake during late September 1972 while Figure 23 shows depletion in the Central basin only during late August 1972.

NEAR SHORE WATER QUALITY

Available information indicates that New York State near shore waters are generally similar to eastern end deep waters with the following exceptions:

a. Cladophora growths are extensive in shallow water areas having a rocky substrate. Accumulations of decomposing, dislodged cladophora occur frequently on the nearby shores.

b. Water Quality is impaired in localized areas significantly affected by pollution sources in the vicinity.

There are localized adverse effects on the water quality at the mouth of the Buffalo River, including oil films, high coliform counts, high iron concentration and others. This effect on Lake Erie is minimal as the outflow from the Buffalo River almost immediately moves downstream along the United States shore of the Upper Niagara River.

In Presque Isle Bay, coliform bacteria exceeded limits nearly all of the time. A single high value for copper and high values for aluminum were noted.

Based on water quality data from a single municipal water intake and 270 beach samples for bacteriological counts, Lake Erie water quality near Michigan is characterized by total coliforms less than 200 organisms/100 ml; fecal coloform less than 20 organisms/100 ml; pH 8.2; iron-Fe 0.2 mg/l; phosphorus-P 0.07 mg/l; total dissolved solids 163 mg/l and suspended solids 4 mg/l. The high phosphorus value is reflected in the high algal counts found in water samples from swimming beaches in 1969.

Chemical analyses indicate that nutrients were adequate in Lake Erie to maintain a large blue-green algal population indicative of a eutrophic lake with very high algal productivity.

Because of mercury contaminations exceeding the 0.5 ppm guideline commercial fishermen in the Michigan waters of Lake Erie may not market walleyes or white bass over 10½" in length

In general, the data from Ohio shows that at some nearshore water intakes there is considerable variation between the maximum and minimum values for a number of the generally accepted public water supply criteria. Furthermore, on occasion values in excess of the established limits for dissolved solids, pH, coliforms and iron were noted at most of the intakes. Low oxygen values were also noted at times.

Notable in the Ontario waters of Lake Erie were the total nitrogen and total phosphorus levels offshore from the mouth of the Grand River; these were higher than typical values found elsewhere in the eastern basin but similar to levels encountered in the western basin.

SPECIFIC AREAS OF NON-COMPLIANCE

Areas of non-compliance in Ohio Lake Erie waters are generally restricted to harbor areas formed by breakwalls. Harbors such as Cleveland, Lorain, Ashtabula, Sandusky, Conneaut, Painesville, Toledo and others confine or restrict rivers entering Lake Erie which result in total dissolved solids in the inner harbors and bays generally ranging from 400 to 600 mg/l. Discoloration, nutrients, and oil films are also noted in several Ohio harbors. Inshore waters from Rocky River to the Chagrin River are not in compliance due to combined sewer overflows and inadequate treatment in the Cleveland area. Closing of beaches outside the Cleveland area were infrequent except where chlorination of sanitary wastes was interrupted. These violations were immediately rectified by Ohio water pollution control authorities. Beaches which constantly displayed problems such as fecal coliform greater than 400 organisms/100 ml were Avon Lake, Edgewater Beach, Geneva State Beach, Perkins Beach, Rocky River Beach, Vermilion on the Lake, City of Vermilion and White City Beach.

Pennsylvania waters of Presque Isle Bay were not in compliance relative to coliform objectives most of the time due to sewer overflows.

The coliform concentration in the vicinity of the Dunkirk sewage treatment plant outfall exceeded the present objectives. Localized areas of lake water discoloration exist at times in the vicinity of the villages of Westfield and Ripley due to wastes from grape and cherry processing plants. The waters within the south end of Buffalo outer harbor fail to meet several parameter objectives including iron concentration and occasional oil films. The problem in the south end of Buffalo Harbor is created by wastes from the Hanna Furnace Steel plant with some contributions from Bethlehem Steel.

The only known areas of non-compliance in the Michigan waters of Lake Erie are:

1. Mercury levels above the guideline of 0.5 ppm for walleyes and white bass.
2. Nuisance phytoplankton blooms with attending cases of elevated pH levels above the 8.5 objective in some instances.

The harbour at Wheatley, Ontario experiences complete depletion of dissolved oxygen in the bottom waters; as well, surface levels were consistently less than 3.0 mg/l. These conditions result from wastes discharged into the harbour from a fish processing plant.

WASTE LOADINGS

The total basin loadings for a number of parameters are summarized in Table 7. However, for the parameters listed complete information was not available.

The total reported phosphorus loading to the lake is 18,630 tons per year with 57% being from the Detroit River and 30% of the total being from tributary sources.

The total annual reported BOD loading to the Lake Erie basin is 255,565 tons per year with 10% being from municipal sources, 7% entering the lake through the tributaries, and 5% being from industrial sources. Exclusive of the loading from the Detroit River approximately 85% enters the lake from the U.S. side.

Information on loadings of total dissolved solids is only partially complete with a total load of 60,081,685 tons per year being reported.

Only partial information is available on the suspended solids loading to the lake. The total reported is 11,323,255 tons per year, of which 7% enters the lake through the tributaries, industrial and municipal sources. The Detroit River accounts for the remaining 93%.

TABLE 7

LAKE ERIE - SUMMARY OF WASTE LOADINGS

	Flow (cfs)	Total P	BOD_5	TDS	SS
CANADA					
Tributaries	2,835	1,030	6,900	1,138,750	99,000
Industrial	70	60	365	12,100*	1,135
Municipal	10	40	1,030	6,000	830
UNITED STATES					
Tributaries	1,780*	4,615	11,535*	5,824,835*	673,000
Industrial	1,275*	230*	12,545*	ND	32,310*
Municipal	400	2,095	23,190	ND	16,980
SUB TOTAL	6,370	8,070	55,565	6,981,685	823,255
Input - From Lake St. Clair including Detroit River	226,700	10,560	200,000	53,100,000	10,500,000
TOTAL:	233,070	18,630	255,565	60,081,685	11,323,255

* - Incomplete information

ND - No data.

NIAGARA RIVER

WATER QUALITY

The dissolved oxygen concentration is generally at saturation throughout the Niagara River at all times. Excluding phosphorus concentrations which may contribute to eutrophication problems in Lake Ontario, the quality of the Canadian waters of the Upper Niagara are generally within the Canada-U.S. Agreement objectives. Along certain sectors of the U.S. shore of the upper river and throughout the lower river such parameters as coliforms, phenol, and iron contravene the objectives. Some areas of discoloration also exist in the vicinity of some U.S. waste outfalls.

The water quality of the Niagara River, at ranges Ni 37.7 and Ni 1.0, in 1972 displayed little change from the water quality of 1971. The primary region of degradation at range Ni 37.7 was found to be near the U.S. shore adjacent to Buffalo, N.Y. Sampling ranges are located on Figure 25.

The uniformity across the width of the river at range Ni 1.0 reflects the complete mixing of the effluents from the upper river and the major discharges to the lower river.

Figures 26 and 27 are graphical plots of phenol and coliform data for two ranges on the Niagara River.

Municipal and industrial wastes from both sides of the border are discharged to the Niagara River, as located in Figures 28 and 29. Many of the U.S. wastes enter the Niagara indirectly through the slow moving Buffalo River. Industrial wastes comprise most of the influent to the City of Niagara Falls waste treatment plant and a significant portion of the influent to the Buffalo sewage treatment plant. Major U.S. industrial waste inputs include chemical, steel, abrasives, paper and oil refining wastes. Dye manufacturing and chlor-alkali production constitute a significant portion of the chemical industry.

The Canadian side of the Niagara River is the recipient of municipal wastes from the Town of Fort Erie, City of Niagara Falls and Chippewa.

In addition to the smaller industrial discharges, Cyanamid of Canada Ltd. contributes the largest volume of wastes to the Niagara River

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along the Canadian shore.

Waste loadings to the Niagara River are summarized in Table 7.

AREAS OF NON-COMPLIANCE

Coliforms

Mean total coliform counts along range Ni 37.7 near the U.S. shore were recorded at 9,000/100 ml which far exceeds the limit established in the April Agreement, Annex 1.

The primary source of coliforms exceeding the objectives in the lower river and along the U.S. shore of the upper Niagara during dry weather periods are the municipal sewer system discharges. During periods of precipitation and runoff, the Buffalo River and smaller tributaries, combined and storm sewer overflows, and street and land runoff are also major sources. When all the municipal treatment plants currently under construction or in the planning stage are in operation, the coliform concentrations in the river during dry weather will be below the permitted maximum except in the Erie Basin and Black Rock Channel. Some river areas may continue to exceed the bacterial objectives during wet weather. Although some steps are being taken to reduce overloading and consequent relief from overflows from sanitary sewer systems, a total solution to runoff and combined sewer overflow pollution for the area has not been developed.

Phenols

Average phenol values of 8 μg/l were recorded near the U.S. shore along range Ni 37.7. The average values along the lower river range Ni 1.0 were found to be 5-6 μg/l.

Iron Concentration

Total iron levels averaged 0.35 mg/l at range Ni 37.7 near the U.S. shore and decreased to an average of 0.16 mg/l at range Ni 1.0.

Aesthetic Problems

The discoloration at river mileage Ni 26.7 is caused by colored paper fibers which may be white, gray, blue or red. The noticeable discoloration is limited in area but very prominent.

The discoloration at river mileage Ni 14.2 is caused by very fine silicon carbide and aluminum oxide abrasives and some waste fibers. It also extends upstream to the base of the New York State Observation Tower and is seen by many visitors to the Niagara River Falls.

Chemical odors emanating from the city of Niagara Falls treatment plant outfall have been a nuisance at times. The discoloration at river mileage Ni 13.2 is caused by the effluent from this plant. It is very prominent and can be seen from certain areas on the Canadian shore. Biddable plans and specifications for a new treatment facility have been prepared and these have resulted in the offer and acceptance of a federal grant to assist in financing construction. This new plant will correct the problems previously referred to.

Ammonia

The average free ammonia level at range Ni 37.7 adjacent to the U.S. shore was 0.120 mg/l. However the value decreased to 0.030 mg/l at range Ni 1.0.

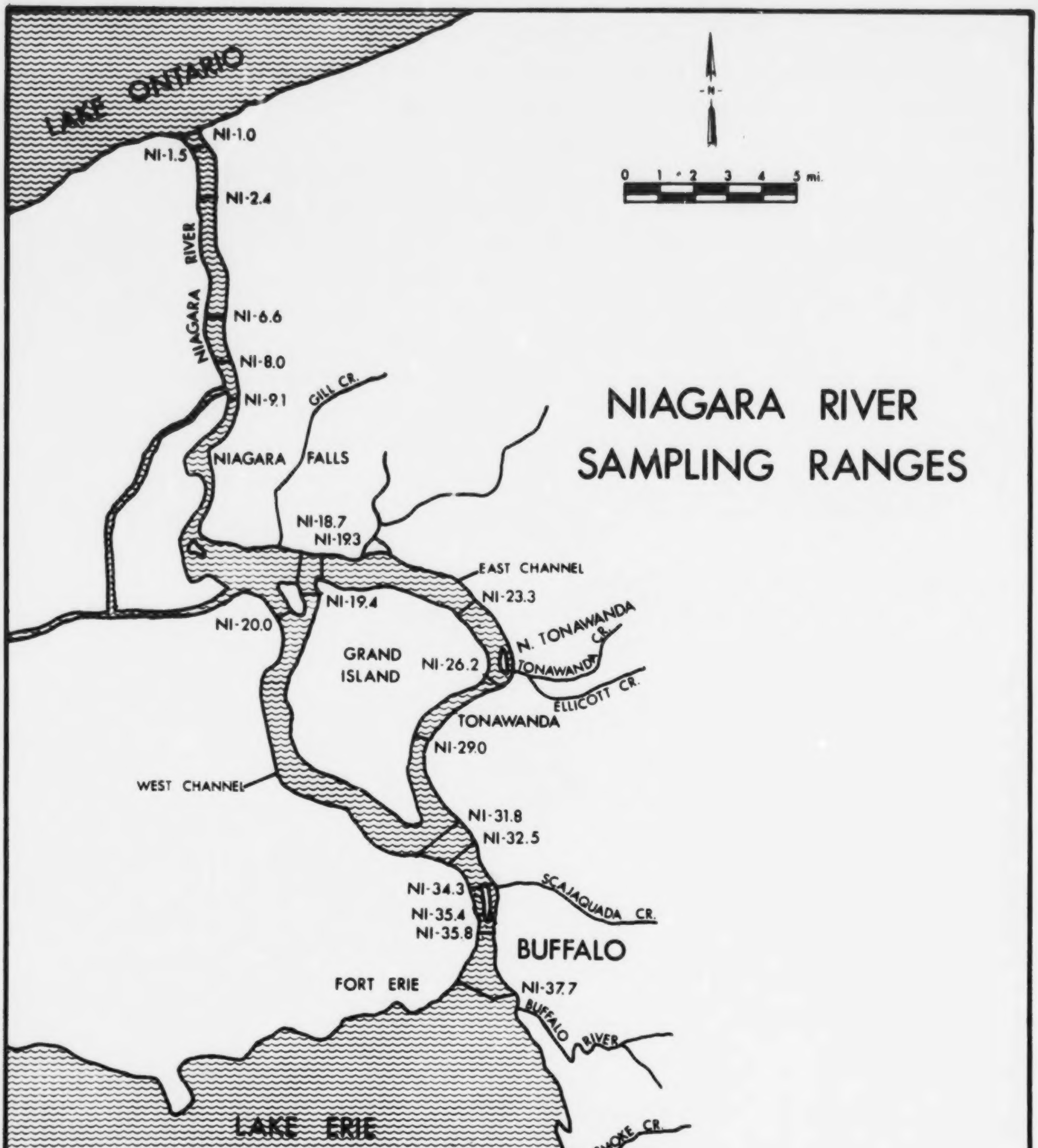
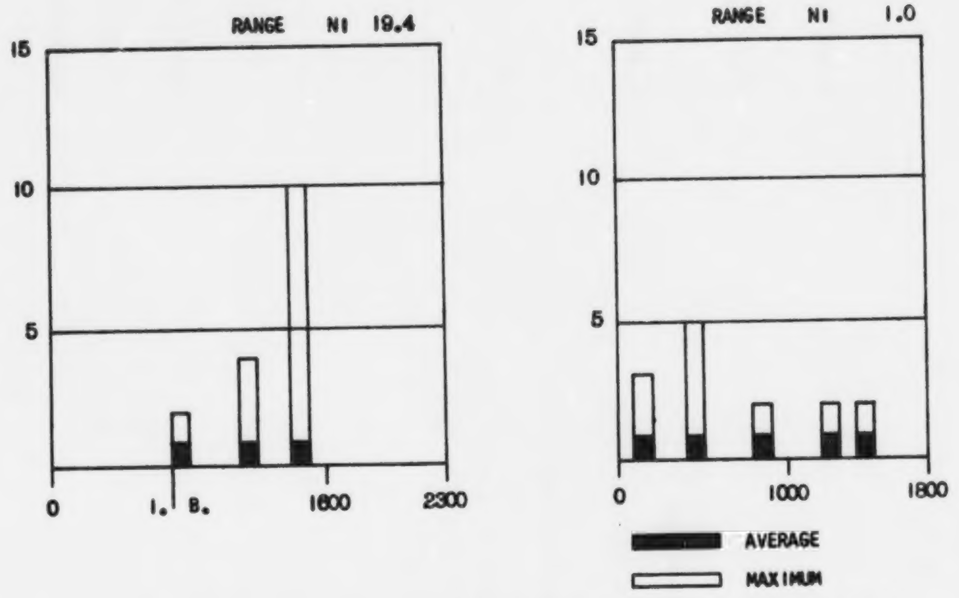

NIAGARA RIVER
SAMPLING RANGES
LAKE ONTARIO
N
0 1 2 3 4 5 mi.
NI-1.0
NI-1.5
NI-2.4
NIAGARA RIVER
NI-6.6
NI-8.0
NI-9.1
GILL CR.
NIAGARA FALLS
NI-18.7
NI-19.3
EAST CHANNEL
NI-19.4
NI-20.0
NI-23.3
N. TONAWANDA
TONAWANDA CR.
GRAND ISLAND
NI-26.2
ELLICOTT CR.
TONAWANDA
NI-29.0
WEST CHANNEL
NI-31.8
NI-32.5
NI-34.3
SCAJAQUADA CR.
NI-35.4
NI-35.8
BUFFALO
FORT ERIE
NI-37.7
BUFFALO RIVER
LAKE ERIE
SMOKE CR.

Figure 25



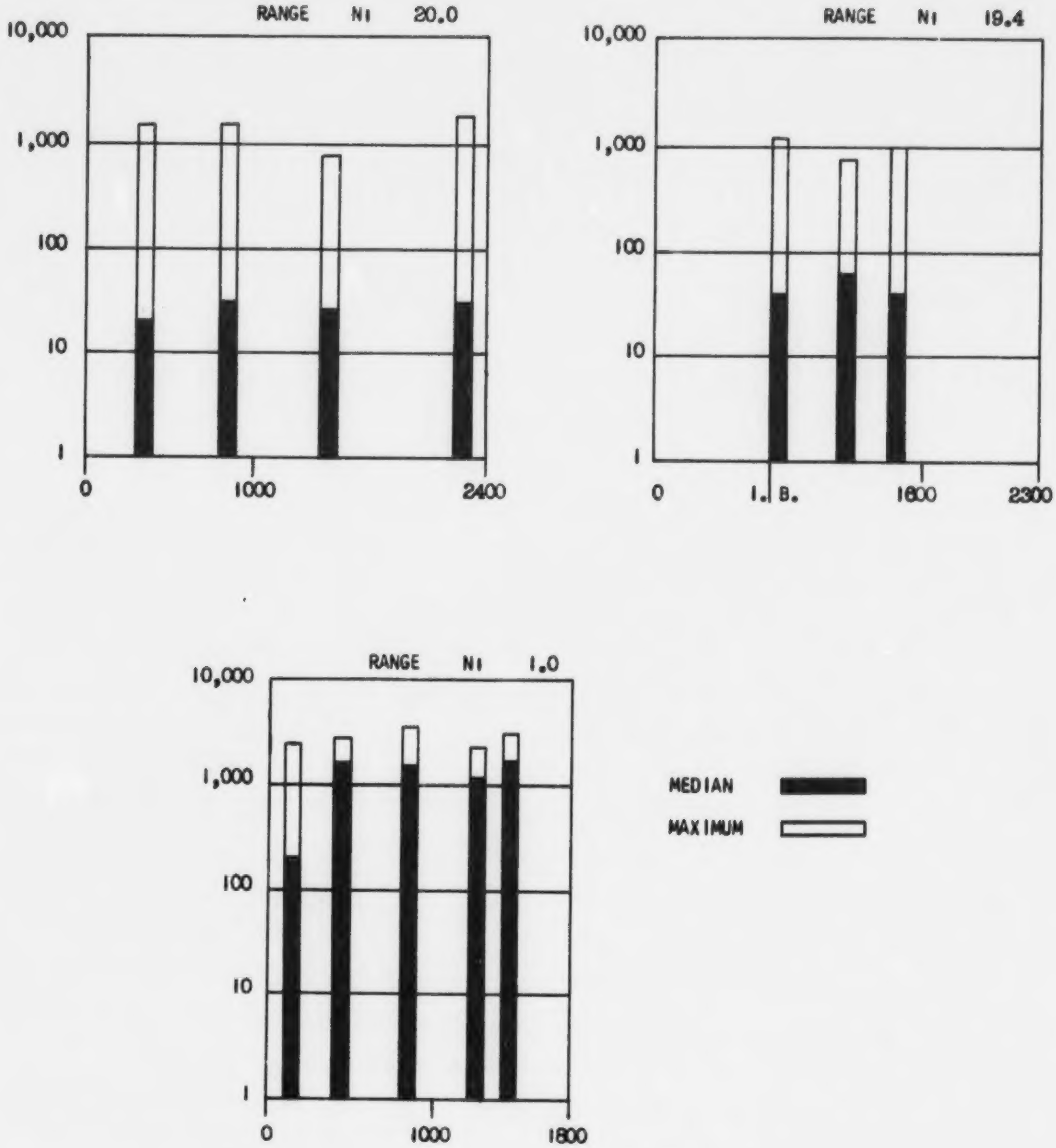
AVERAGE and MAXIMUM PHENOL CONCENTRATIONS

NIAGARA RIVER - 1968 TO 1970* COMBINED DATA

SCALES: HORIZONTAL - IN FEET FROM AMERICAN SHORE AS INDICATED
VERTICAL - PHENOL, PARTS PER BILLION, AS INDICATED.

* 1970 DATA TO THE END OF SEPTEMBER SURVEY.

Figure 26

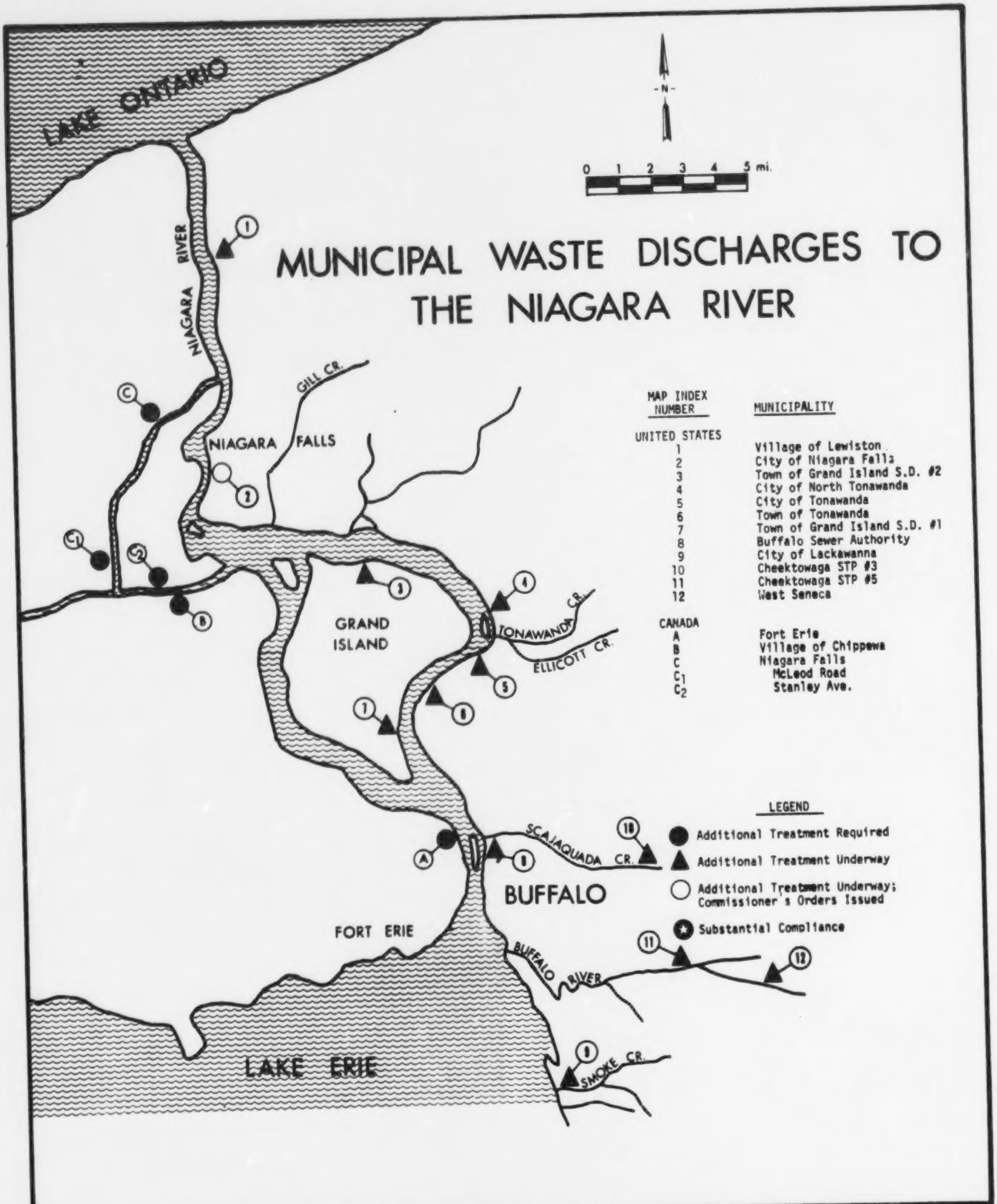


MEDIAN and MAXIMUM COLIFORM DENSITIES

NIAGARA RIVER - 1968 TO 1970 COMBINED DATA

SCALES: HORIZONTAL - IN FEET FROM AMERICAN SHORE AS INDICATED
VERTICAL - COLIFORM, M F PER 100 MI, AS INDICATED

Figure 27



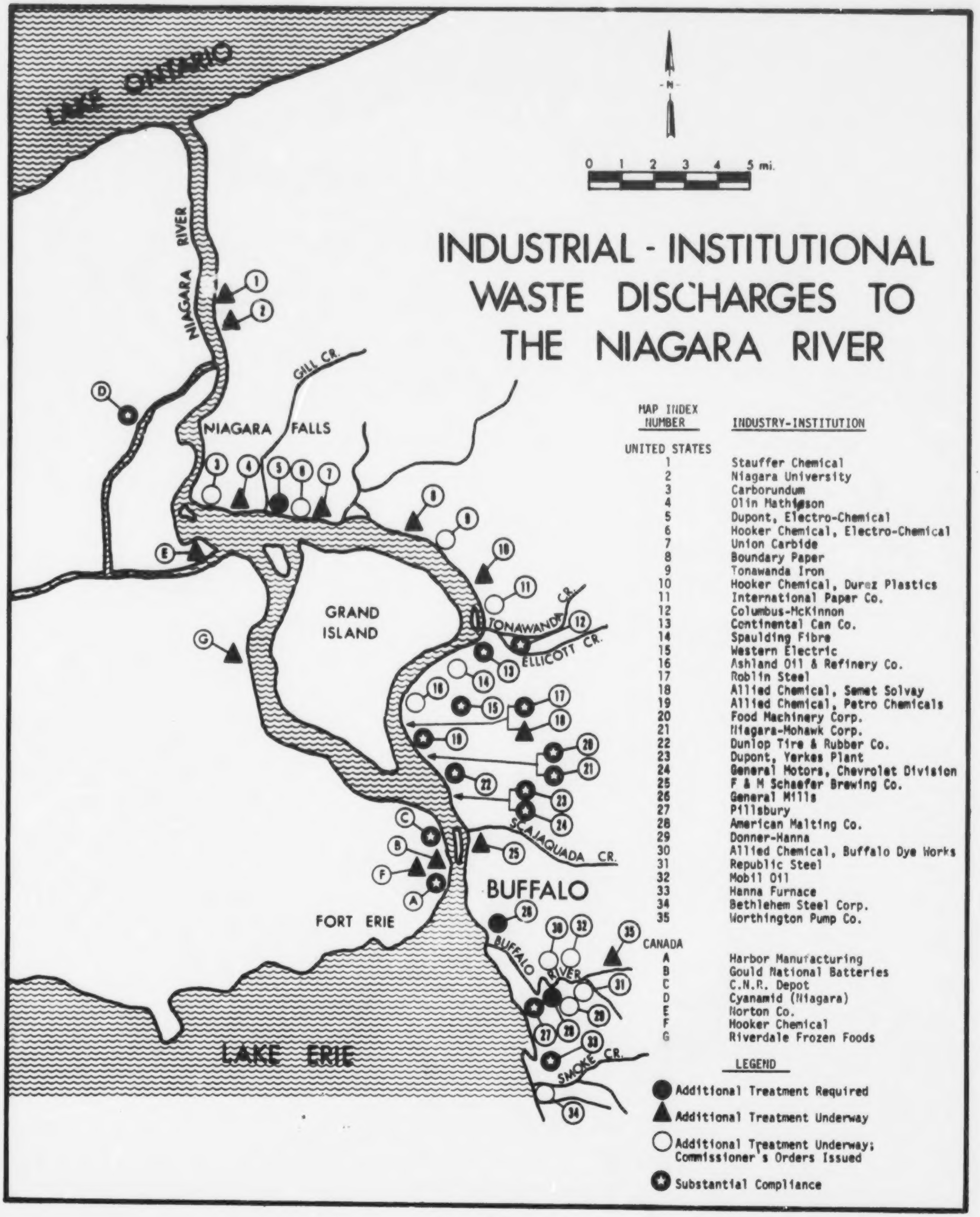
MUNICIPAL WASTE DISCHARGES TO THE NIAGARA RIVER

MAP INDEX NUMBER	MUNICIPALITY
UNITED STATES	
1	Village of Lewiston
2	City of Niagara Falls
3	Town of Grand Island S.D. #2
4	City of North Tonawanda
5	City of Tonawanda
6	Town of Tonawanda
7	Town of Grand Island S.D. #1
8	Buffalo Sewer Authority
9	City of Lackawanna
10	Cheektowaga STP #3
11	Cheektowaga STP #5
12	West Seneca
CANADA	
A	Fort Erie
B	Village of Chippewa
C	Niagara Falls
C_1	McLeod Road
C_2	Stanley Ave.

LEGEND

● Additional Treatment Required
▲ Additional Treatment Underway
○ Additional Treatment Underway; Commissioner's Orders Issued
✪ Substantial Compliance

Figure 28



INDUSTRIAL - INSTITUTIONAL WASTE DISCHARGES TO THE NIAGARA RIVER

MAP INDEX NUMBER	INDUSTRY-INSTITUTION
UNITED STATES	
1	Stauffer Chemical
2	Niagara University
3	Carborundum
4	Olin Mathieson
5	Dupont, Electro-Chemical
6	Hooker Chemical, Electro-Chemical
7	Union Carbide
8	Boundary Paper
9	Tonawanda Iron
10	Hooker Chemical, Durez Plastics
11	International Paper Co.
12	Columbus-McKinnon
13	Continental Can Co.
14	Spaulding Fibre
15	Western Electric
16	Ashland Oil & Refinery Co.
17	Roblin Steel
18	Allied Chemical, Semet Solvay
19	Allied Chemical, Petro Chemicals
20	Food Machinery Corp.
21	Niagara-Mohawk Corp.
22	Dunlop Tire & Rubber Co.
23	Dupont, Yerkes Plant
24	General Motors, Chevrolet Division
25	F & M Schaefer Brewing Co.
26	General Mills
27	Pillsbury
28	American Malting Co.
29	Donner-Hanna
30	Allied Chemical, Buffalo Dye Works
31	Republic Steel
32	Mobil Oil
33	Hanna Furnace
34	Bethlehem Steel Corp.
35	Worthington Pump Co.
CANADA	
A	Harbor Manufacturing
B	Gould National Batteries
C	C.N.R. Depot
D	Cyanamid (Niagara)
E	Norton Co.
F	Hooker Chemical
G	Riverdale Frozen Foods

LEGEND

● Additional Treatment Required

▲ Additional Treatment Underway

○ Additional Treatment Underway; Commissioner's Orders Issued

✪ Substantial Compliance

Figure 29

TABLE 8

NIAGARA RIVER - SUMMARY OF WASTE LOADINGS

(Short tons per year)

	Flow (cfs)	Total P	BOD_5	TDS	SS
CANADA					
Tributaries		nil	nil	nil	nil
Industrial		nil	20	165	10
Municipal		60	1,250	7,180	880
UNITED STATES					
Tributaries*	930	95	1,960	165,865	24,410
Industrial	145	ND	120	ND	4,700
Municipal	430	2,700	42,910	ND	65,900
TOTAL:	1,505	2,855	46,260	173,210	95,900

* - includes Buffalo River contribution

ND - No data

LAKE ONTARIO

WATER QUALITY

Nutrients

Figures 30 to 32 show the areal distributions of the annual mean concentrations of soluble reactive phosphate, total phosphorus and inorganic nitrogen respectively, in the surface waters of the lake from data collected in 1971.

For the most part, the annual mean concentrations of soluble reactive phosphate in the surface waters are within the range 5 to 10 µg/l P. In the early spring, however, surface concentrations lay in the range 10 to 15 µg/l P, while in the summer months they dropped well below 5 µg/l P. The highest mean soluble reactive phosphate concentrations were found in the inshore region around Toronto.

The surface distribution (Figure 31) of total phosphorus is more revealing than that for soluble reactive phosphorus. Here the influence of the Toronto region and the inflow from the Niagara River can be quite readily discerned. In general, the mean annual surface total phosphorus concentration ranged from 20 to 25 µg/l. The high concentrations found near the Niagara River mouth and in the Toronto region do not extend far out into the lake, but seem to spread more along the shore of the lake, consistent with estimated circulation patterns.

Annual mean inorganic nitrogen concentrations in the lake ranged from 150 to 250 µg/l N (Figure 32). The marked concentration gradients around the Toronto region point out its importance as a source of inorganic nitrogen to the lake. The low inorganic nitrogen concentration east of Prince Edward County is due to the early start of nitrate depletion in this region. The unusual feature off the south shore between Rochester and Oswego, which shows a marked high next to a marked low, is due primarily to the data from the spring sampling cruise. Later cruises in the summer and fall did not show this feature. During the summer the inorganic nitrogen concentration in the surface waters of the lake was much lower than indicated by Figure 32, with most of the lake having concentrations below 50 µg/l N.

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Chlorophyll a

Figure 33 shows the areal distribution of the mean (overall 1970 - 1971 cruises) total chlorophyll a concentration at a one-metre depth in Lake Ontario. From figure 33 it can be seen that for the most part the lake surface concentrations lay in the range from 2 to 6 µg/l. Only in a few inshore areas, such as near Port Hope and Cobourg, Ontario; from Burlington, Ontario, to the mouth of the Welland Canal; near the U.S. shore east of Rochester, N.Y.; and in the region near the St. Lawrence River, did mean concentrations reach as high as 6 µg/l. The presence of the thermal bar appears to influence this pattern of highest mean values. In general, the highest recorded values appeared in the inshore regions of the western third of the lake, with one reading as high as 25 µg/l (figure 34). The shallow waters of the lake east of Prince Edward County were a region of rather high maximum total chlorophyll a concentrations. The lowest mean values, less than 2 µg/l, were generally found mid-lake.

Dissolved Oxygen

Throughout the year the upper waters of the lake have had dissolved oxygen levels well in excess of the 6 mg/l limit established by the Canada-U.S. Agreement. Even the lowest dissolved oxygen concentration found in the bottom waters of the lake was greater than the 6 mg/l limit set for the upper waters.

The areal distribution of dissolved oxygen percent saturations in the bottom waters of the lake in August 1970, is shown in figure 35. These data were preferred to any of the 1971 data, because the cruise from which the former data were taken was timed much closer to the period of maximum bottom oxygen depletion. It can be seen from figure 35 that most of the lake bottom waters had oxygen percent saturations greater than 85%. With the exception of the centre of the western region off Toronto, the area of the lake with bottom oxygen saturation less than 80% was restricted to the northern shore region. Data from an August 1971 cruise show that low bottom oxygen percent saturations also occur in the shallow waters of the lake east of Prince Edward County.

NEAR SHORE WATERS

Violation of specific water quality objectives has been noted in several localized areas along the U.S. shoreline. Hamlin Beach, although still open, is a borderline case as demonstrated by the 1972 EPA beach sampling program. Several of these beach closures tend to be the result of localized situations of an intermittent nature hinging on wind direction, currents, etc. In addition to the beaches, the most conspicuous problem areas are several small harbours along the shore - Oswego Harbour, Black River Bay, and in particular the Rochester Embayment.

A comparative study of phosphorus, nitrogen and turbidity levels in the Ontario near shore waters extending from the Niagara River outlet along the shoreline to Cobourg indicated a significant reduction in 1972 from the levels observed in 1968-69.

While beaches along the St. Catharines-Hamilton shoreline remain placarded for the most part because of bacterial contamination, some local improvements were reported in 1972. Along the shoreline from Mississauga, eastward to Oshawa-Whitby, move favourable water quality conditions were encountered. Where other conditions permit, these beaches have generally remained open for use in recent years.

SPECIFIC AREAS OF NON-COMPLIANCE

Recent sampling within the Rochester Embayment has revealed upward trends for several parameters considered to be indicative of the diverse categories of pollution to which it is subjected. At isolated stations and at different times, iron, total dissolved solids, and total coliforms have been noted to be in excess of specific water quality objectives.

Local public bathing beaches ringing the embayment remain closed due to bacterial pollution. Movement of waste in and around the embayment by wind and temperature can cause a day-to-day fluctuation in sanitary conditions at these beaches. Recent surveys continue to show total and fecal coliform counts in excess of specific water quality objectives. A major source of the embayment's problems are those wastes transported by the Genesee River.

Surveys of Rochester Harbor in December 1971 and May 1972 revealed extensive degradation by both industrial and municipal wastes. In excess of

EPA dredge spoil criteria were mercury, lead, zinc, and oil and grease. The latter is also frequently found floating in unsightly slicks.

Three public beaches in Niagara County, N. Y. were closed for the first time in the summer of 1971 and remained closed in 1972 because of pollution problems caused by sewage discharges into creeks and rivers which empty into the lake. Problems stem from poorly treated discharges to the Niagara River, Four Mile Creek and Eighteen Mile Creek. The beaches affected were Fort Niagara State Park, Four Mile Creek State Park and Olcott Beach.

In the Oswego Harbor and lower Oswego River area, conditions brought about by organic pollution have undoubtedly begun to improve with the removal of the raw discharge of the City of Oswego's industry a short distance upstream.

The two heavily industrialized areas of Hamilton (Burlington Bay) and Toronto are notable locations where the water quality objectives are not being met. In the harbours at each location high values of total phosphorus and total nitrogen are encountered. Bacterial densities (medium coliform level of 1740 organisms per 100 ml) and chloride levels (average of 55 mg/l) were observed in the Burlington Canal outlet of Burlington Bay.

WASTE LOADING

Because Lake Ontario is the last in the chain of the Great Lakes, all soluble pollutants that emerge from the other lakes eventually find their way to Lake Ontario via the Niagara River. This would remove the concept that the condition of the river is the result of direct discharges to it.

Waste loading data for Lake Ontario are listed in Table 9.

The total phosphorus loading to the lake from the basin is 14,470 tons/year. The Niagara River inflow is the major contributor to the load with about 42% of the total. The tributaries and municipalities each contribute 28%, the remaining being industrial. Important municipal inputs are the Toronto treatment plants with a combined loading of 1,635 tons/year and Hamilton with a loading of 394 tons/year.

The BOD_5 loading to the lake is 518,300 tons/year. The bulk of the load, 76%, enters the lake via the Niagara River. The tributary input is 80,100 tons/year or 16% of the total loading.

The total dissolved solids (T.D.S.) loading to the lake is 56,744,000 tons/year with 80% of the load entering through the Niagara River and 20% through the tributaries. The municipal inputs are negligible.

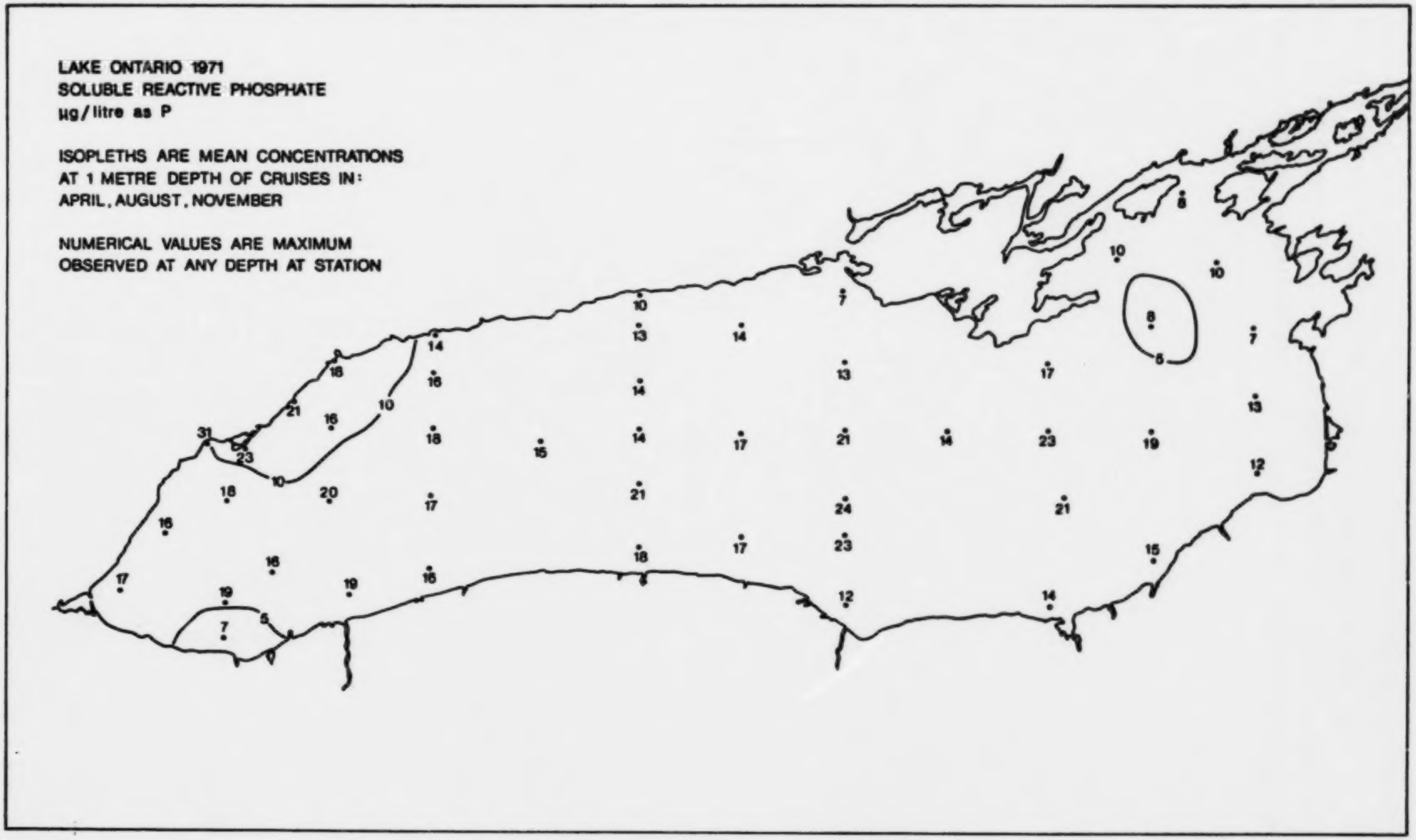
LAKE ONTARIO 1971
SOLUBLE REACTIVE PHOSPHATE
µg/litre as P
ISOPLETHS ARE MEAN CONCENTRATIONS
AT 1 METRE DEPTH OF CRUISES IN:
APRIL, AUGUST, NOVEMBER
NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATION
8
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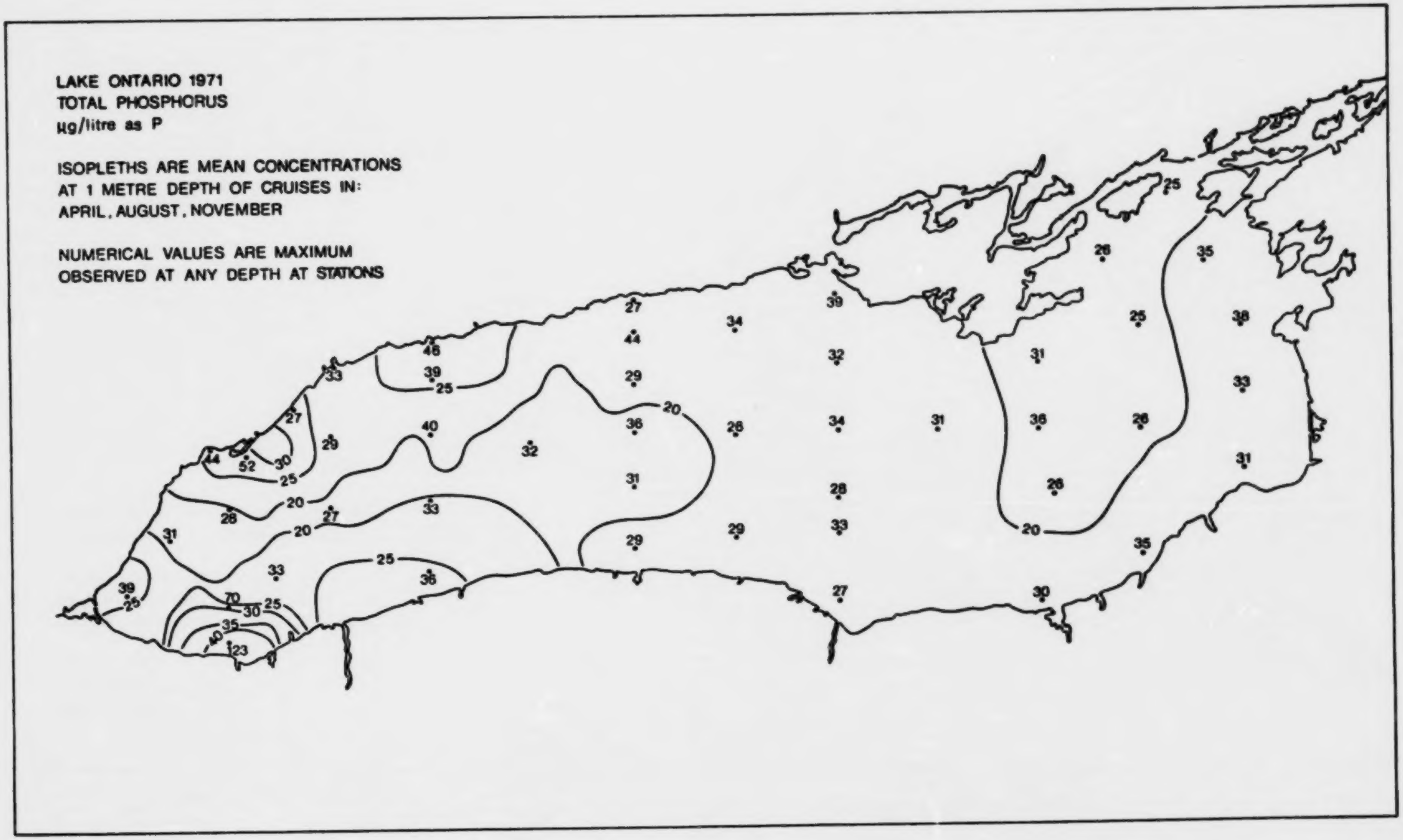
Figure 30


LAKE ONTARIO 1971
TOTAL PHOSPHORUS
µg/litre as P
ISOPLETHS ARE MEAN CONCENTRATIONS AT 1 METRE DEPTH OF CRUISES IN: APRIL, AUGUST, NOVEMBER
NUMERICAL VALUES ARE MAXIMUM OBSERVED AT ANY DEPTH AT STATIONS
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46
39
25
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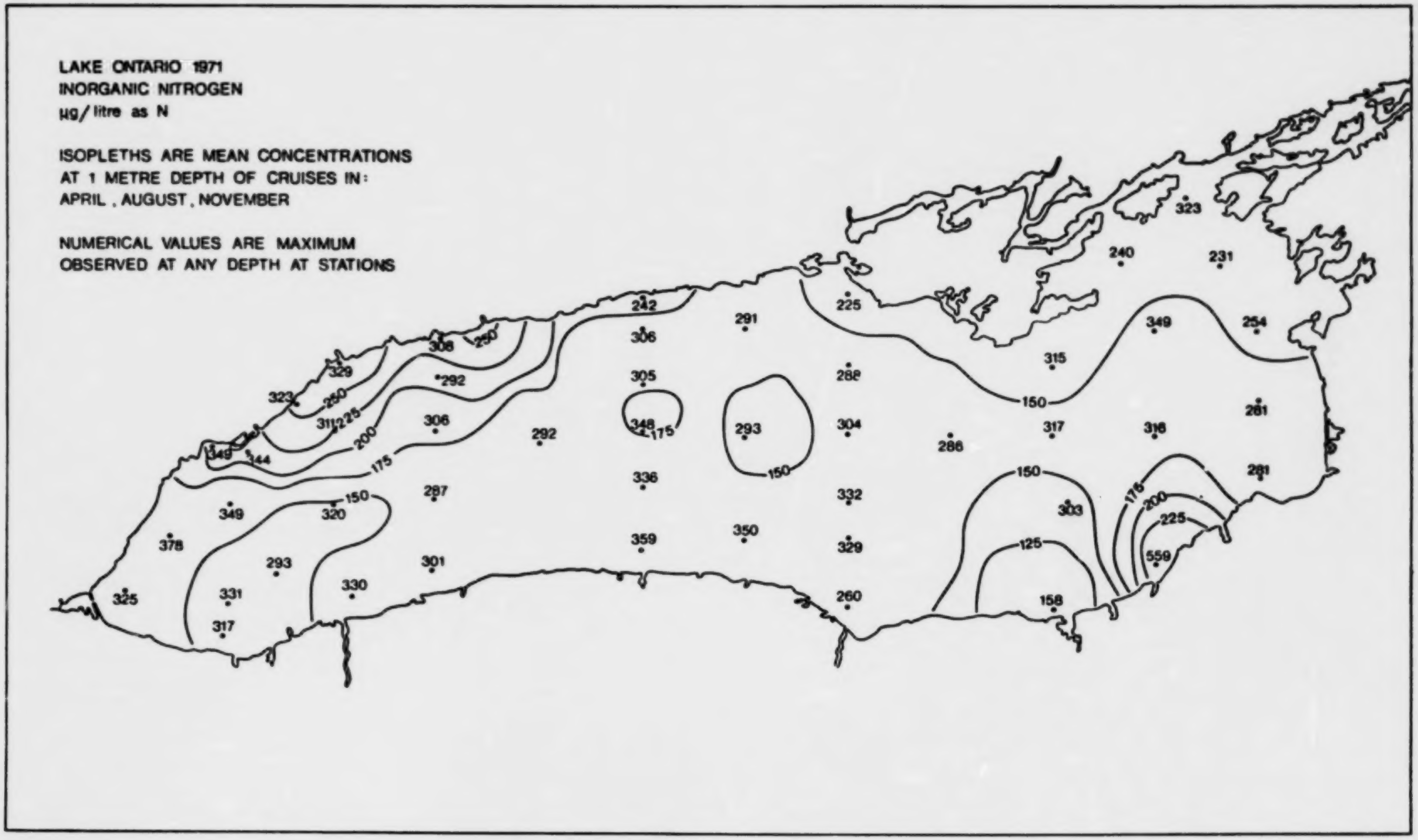
Figure 31

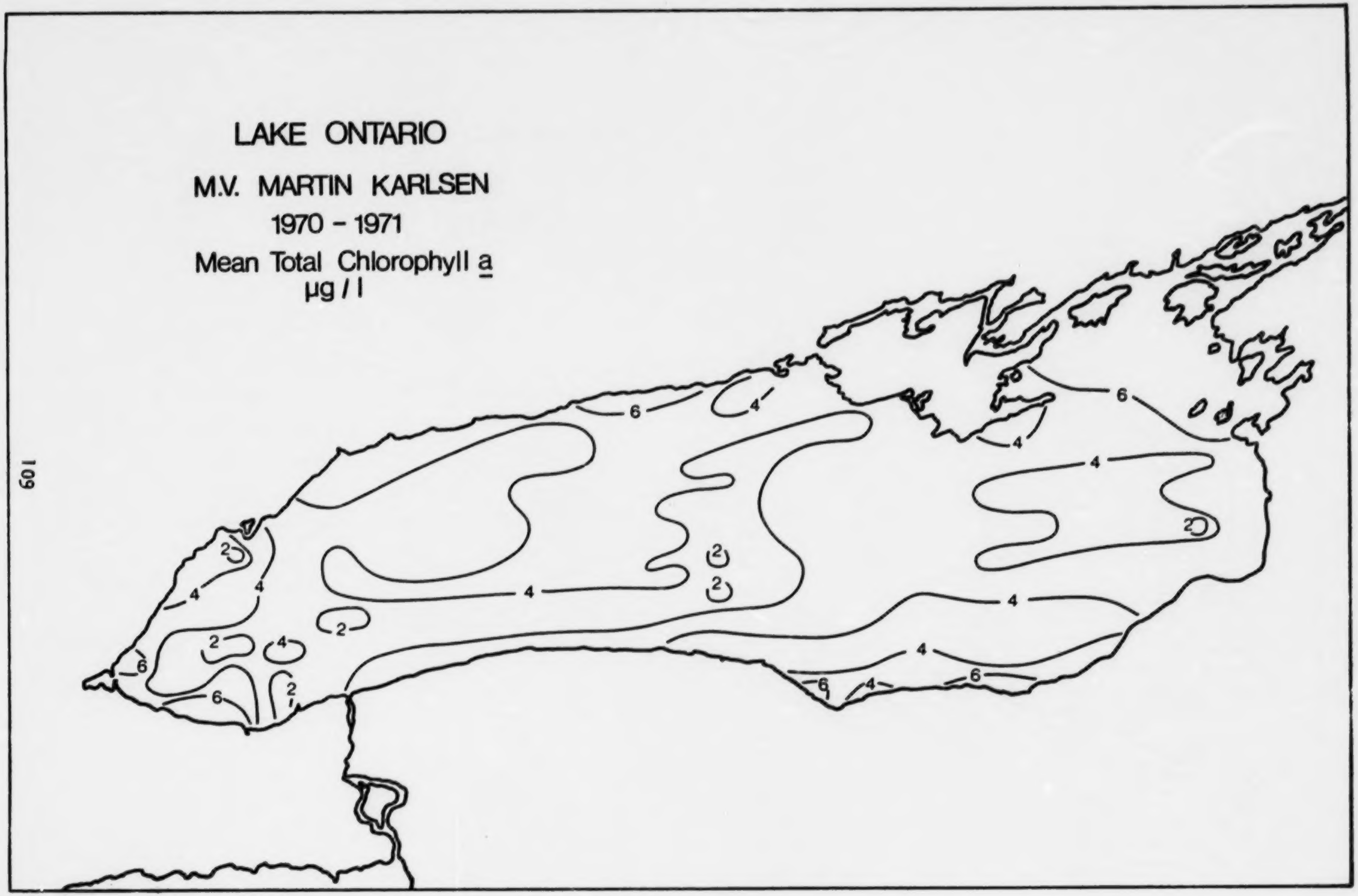


LAKE ONTARIO 1971
INORGANIC NITROGEN
µg/litre as N

ISOPLETHS ARE MEAN CONCENTRATIONS
AT 1 METRE DEPTH OF CRUISES IN:
APRIL, AUGUST, NOVEMBER

NUMERICAL VALUES ARE MAXIMUM
OBSERVED AT ANY DEPTH AT STATIONS

Figure 32



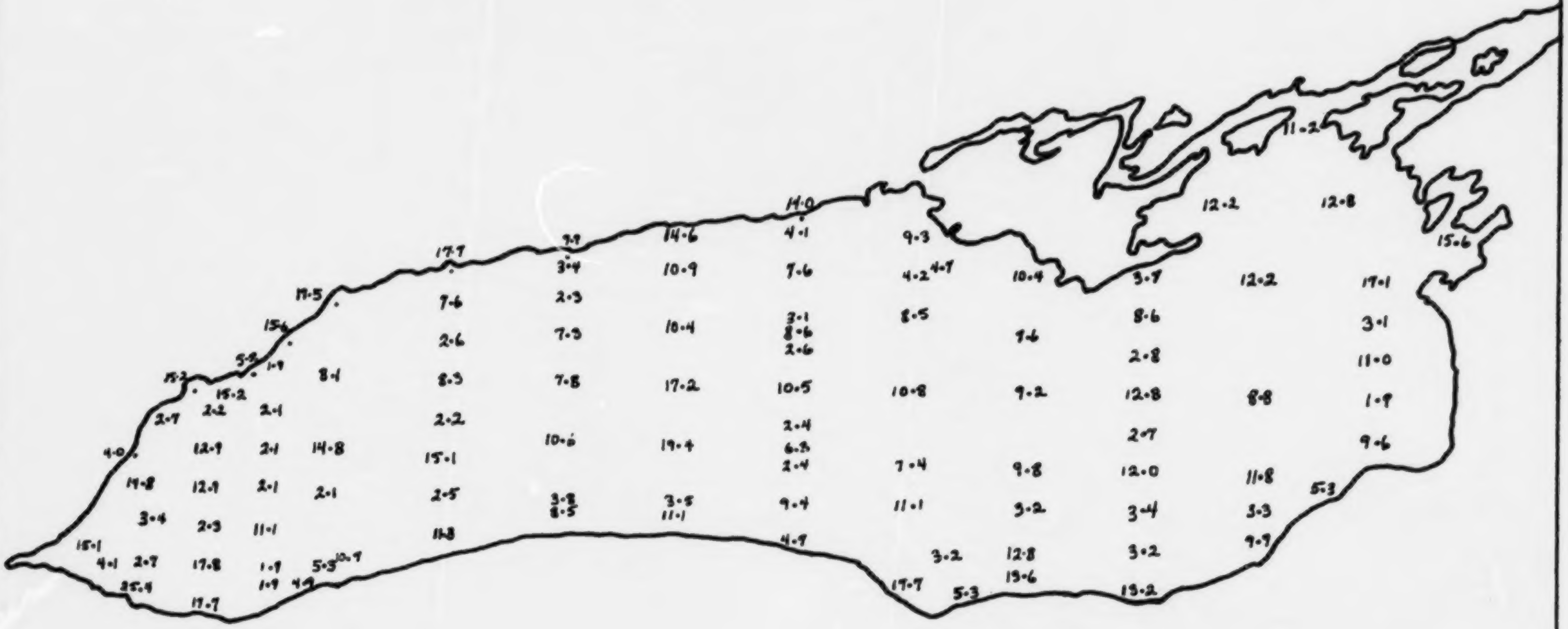
LAKE ONTARIO

M.V. MARTIN KARLSEN

1970 - 1971

Mean Total Chlorophyll a
µg / l

Figure 33

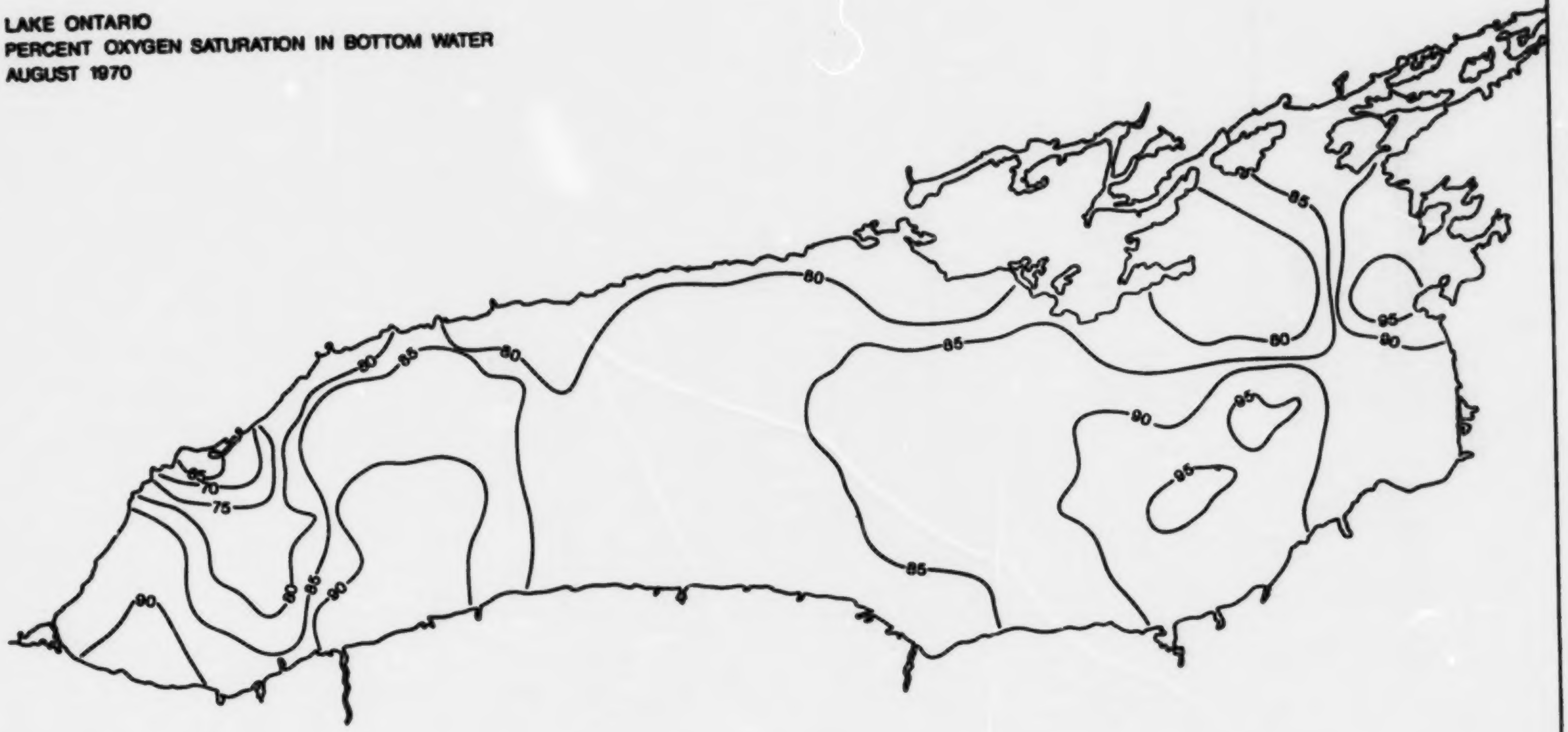


LAKE ONTARIO

1970-71

Maximum Total Chlorophyll a

Figure 34



LAKE ONTARIO
PERCENT OXYGEN SATURATION IN BOTTOM WATER
AUGUST 1970

Figure 35

TABLE 9

LAKE ONTARIO - SUMMARY OF WASTE LOADINGS
(Short tons per year)

		Flow (cfs)	Total P	BOD_5	TDS	SS
CANADA						
	Tributaries	8,293	1,880	39,900	3,490,000	250,000
	Industrial	1,885	330	600	260,000	36,400
	Municipal	344	2,660	19,000	375,000	15,000
UNITED STATES						
	Tributaries	21,048	2,180	40,200	7,446,000	627,000
	Industrial	NONE				
	Municipal	135	1,350	21,000	ND	11,900
SUB-TOTAL:		31,690	8,400	120,700	11,571,000	940,300*
Input - Lake Erie including Niagara River and Welland Canal		236,800	6,070	397,600	45,173,000	1,630,000
TOTAL:		268,490	14,470	518,300	56,744,000	2,570,300

* - Incomplete

ND - No data.

ST. LAWRENCE RIVER

WATER QUALITY

The water quality of the St. Lawrence River parallels the water quality of Eastern Lake Ontario. The large volume of water flowing into the St. Lawrence River from Lake Ontario assists in the rapid assimilation and dilution of waste loadings. Although the St. Lawrence River illustrates generally a high degree of water quality, there is impairment of localized areas downstream from the larger municipalities in Ontario. Nuisance growths of rooted aquatic plants and Cladophora occur in the shallow waters at many locations in the river.

Along the U.S. shoreline, local water quality areas of impairment are encountered downstream from a number of villages and industries. Discoloration and floating solids have been noted below some industrial outfalls.

WASTE LOADINGS

The St. Lawrence receives the loadings from municipal and industrial waste sources. Three tributaries, Cataraqui River, Little Cataraqui River and Gananoque Creek enter the river from Canada.

There are six main tributaries lying wholly or partially within the United States and discharging to the St. Lawrence River. These are the Oswegatchie, Grass, Raquette, St. Regis, Salmon and Chateaugay Rivers. Water quality of these streams is of generally high quality, although they are subjected to numerous small municipal waste discharges as well as industrial effluents including several large paper mill discharges.

Six relatively small U.S. municipal effluents totalling approximately 2.4 MGD are discharged directly to the St. Lawrence. These are spaced quite evenly along the river's length and may, at worst, create extremely localized areas of pollution. By far the largest of these discharges is that of the City of Ogdensburg with a primary effluent of 1.65 MGD.

The waste loadings are summarized in Table 10, and the locations noted on figure 36.

AREAS OF NON-COMPLIANCE

Along the Canadian side of the St. Lawrence River, there are localized areas of slight discoloration downstream from Kingston, in the vicinity of Gananoque, Brockville, Cardinal and Cornwall. Upstream of Cornwall and the Iroquois Locks, localized contamination of beach areas around some of the islands occurs.

The few localized areas of pollution and/or Agreement objective contravention along the U.S. shore have been primarily caused by industrial waste discharges. In all cases, measures are being taken or have been completed which should correct these situations.

TABLE 10

ST. LAWRENCE RIVER - SUMMARY OF WASTE LOADINGS

(Short tons per year)

	FLOW (cfs)	TOTAL P	BOD_5	TDS	SS	Total N
CANADA						
Tributaries	394	15	630	68,130	2,000	260
Industrial	195	ND	19,800	ND	20,545	1,710
Municipal*	45	215	3,225	24,850	2,970	1,075
UNITED STATES						
Tributaries	4,665	220	ND	368,600	ND	2,350
Industrial	25	ND	905	7,250	2,250	85
Municipal	5	40	750	ND	490	ND
TOTAL:	5,329	490	25,310	468,830	28,255	5,480

* - Other waste loads include:

Chloride	9,200 (Short tons per year)
Iron (fe)	80
Phenol	0.2
Zinc	55
Sulphate	2,270

ND - No data.

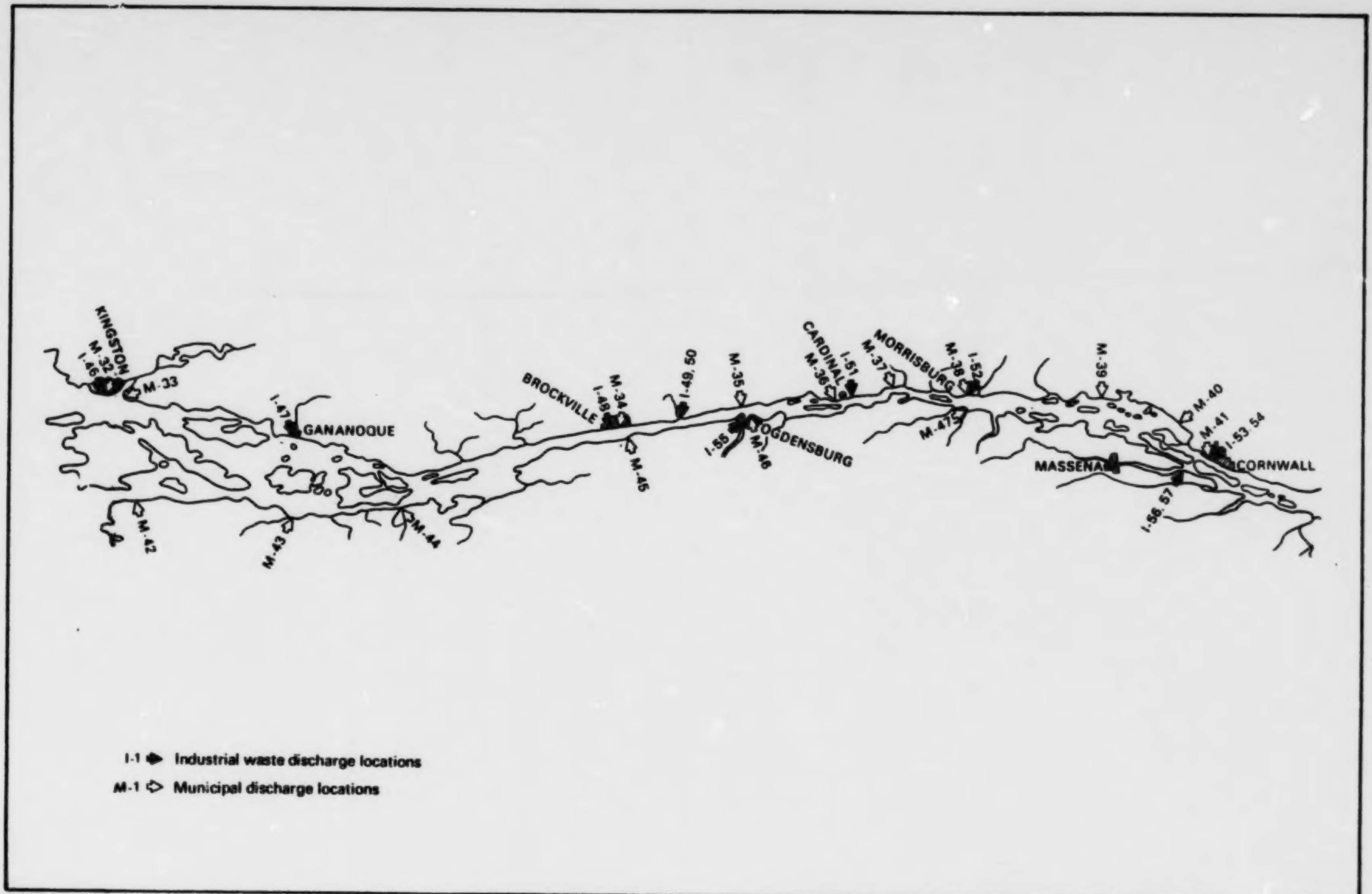


Fig. 36 Sources and locations of industrial and municipal wastes - International Section of the St. Lawrence River.

Chapter IV

REMEDIAL PROGRAMS AND OTHER CONTROL MEASURES

Note: The information on the first 15 pages is a summary of Chapter IV. The main portion of the Chapter begins on page 131.

SUMMARY OF SECTION A - POLLUTION FROM MUNICIPAL SOURCES

A.1. CONSTRUCTION AND OPERATION OF WASTE TREATMENT FACILITIES

The States plans for treatment facilities and operation basically follow the Ten State Standards for Sewage Works and other miscellaneous reference sources. The Ontario Ministry of the Environment is involved in many aspects of construction and regulation of waste treatment plants including definition of problem areas, guidelines for sewage collection and treatment process, stream or lake loading criteria, financing, design review and for project construction by Ministry - municipal agreement for construction, supervision, control, and operation.

Notable exception to Municipal control programs are as follows:

Implementing rules, regulations, and/or guidelines regarding the new eligibilities under the U.S. Water Pollution Control Act of 1972 have not yet been developed. The new eligibilities include previously eligible sewage treatment plants, intercepting sewers and outfall sewers, sewage collection systems and methods or systems "for preventing, abating, recucing ..... including storm water runoff or industrial wastes, including waste in combined storm and sanitary sewer systems".

Illinois will have no sewage, industrial waste or other wastes of any kind being discharged in the waters of Lake Michigan after 1975.

Michigan has Commission orders on Clay Township, Kimball Township, City of Algonac, Ira Township and City of St. Clair in the St. Clair River. The reason for delay in construction of the facilities is lack of funding, either municipal or federal. In the Detroit River, the City of Detroit is under order to provide interim treatment facilities for BOD, suspended solids, and phosphorus removal by December 1971, secondary treatment with 80% phosphorus removal by November 1973, 90% phosphorus removal by December 1975, and additional phenol removal by August 1976. The City has substantially completed the interim facilities and is complying with the BOD removal and disinfection requirements of the Order. Periodic compliance has been achieved for phosphorus removal, but suspended solids are

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not meeting restrictions. The City is experiencing difficulty with sludge disposal.

Permits for the Minnesota Villages of Grand Marias and Two Harbors were issued by the MPCA in early February, 1973, following allocation of funds by the Federal and State Governments. Construction of tertiary sewage treatment facilities for these two municipalities will commence in April and May of 1973. The four Duluth treatment plants have been given a time extension since the responsibility for wastewater treatment systems has been assumed by the recently formed Western Lake Superior Sanitary District (WLSSD).

In New York, the communities of Lackawanna, City of Tonawanda, the Town of Tonawanda, and North Tonawanda are generally delayed due to failure to obtain Federal and/or State approval before original grant funds were no longer available, additional causes at individual plants, and New York's justifiable requirement of pilot plant investigations of proposed phosphorus removal processes, also generally slowed completion of final plans.

Wisconsin municipalities are generally beyond the critical stage of combating gross pollution and are concerned with expanding the present systems. In Lake Superior the City of Superior is still exploring NEMDA interstate treatment arrangements; however, they have submitted plans for their own secondary treatment plant and phosphorus removal system and applied for financial assistance.

In Lake Erie, notable exceptions for Ohio are the cities of Cleveland and Painesville and the Cuyahoga County Sewer District #6 (Rocky River). These projects are considerably behind schedules established as a result of the Lake Erie Enforcement Conference.

The Province of Ontario has completed or is presently negotiating with communities throughout the Great Lakes Basin for scheduled programs for the abatement of pollution. In the Lake Superior Basin the communities are the City of Thunder Bay, the Township of Schreiber, the Township of Marathon, the Township of Terrace Bay, the Improvement District of Red Rock, and the Township of Nipigon. On the St. Mary's River, enlargement of the sewage treatment plant at Sault Ste. Marie is expected to be completed in early 1974. In Lake Huron-Georgian Bay, the municipalities of Penetang and Midland are required to complete nutrient removal by December 31, 1973. The Cities of

Sarnia and Windsor, in the St. Clair-Detroit River system, have nutrient programs scheduled for completion in 1973. The nutrient control programs for the Cities of St. Catharines and Hamilton, and Metropolitan Toronto are scheduled for completion in 1975.

A.2. PROVISION OF FINANCIAL RESOURCES

Assistance for pollution control works is available to municipalities from both Federal Governments. The States and Provincial governments provide additional financial support to municipalities for sewage treatment facilities.

The Federal Water Pollution Control Act as amended October 18, 1972 increases the maximum grant percent level to 75% and includes other treatment works not previously eligible. Implementing rules, regulations, and/or guidelines for the new eligibilities have to be developed. With the passage of the act some states will have to change their grant program to make it compatible with the new Federal program.

Although national allotments for FY/73 were the same as FY/72 and less than the authorized appropriations ($2 billion), most of the States tributary to the Great Lakes received greater allocations than they received in FY/72 because of a modified distribution formula. The program in the Great Lakes Basin will emphasize the construction of phosphorus removal facilities. In the Upper Great Lakes Basin, Ontario is financing sewage works in municipalities in a similar manner through a federal government loan/grant program administered by CMHC, however, on a project by project basis as these are developed year by year.

A.3. ESTABLISHMENT OF CONSTRUCTION AND OPERATING STANDARDS

The establishment of construction and operating standards will be implemented in the United States by the Environmental Protection Agency as an across-the-board policy. The amended Act of 1972 sets forth many deadlines for individual requirements such as secondary technology, best available technology, etc. Most states have been designing, constructing and operating facilities according to the Ten State Standards.

In Ontario, the Ministry of the Environment establishes municipal and industrial waste effluent requirements on the basis of satisfying the water quality standard established by the Ministry. Design and construction are based on application of best practicable technology to the individual discharge. All sewage treatment programs must be reviewed and approved by the Ministry. Operator training is also sponsored by the Ministry.

A.4. OVERFLOWS FROM COMBINED STORM AND SANITARY SEWERS

The U.S. Federal Water Pollution Control Act, as amended, 1972 has included in the definition of eligible sewage treatment systems, waste in combined storm and sanitary sewer systems. Guidelines relating to their eligibility have not yet been developed. Most of the states are presently active in defining the inadequacies in their system and correcting these as soon as funds permit.

The Canadian Government and the Province of Ontario have entered an agreement to abate pollution in the Lower Great Lakes system. Research and Studies have and are being carried out in a number of Ontario municipalities.

A.5. MONITORING, SURVEILLANCE AND ENFORCEMENT

Most agencies require monitoring to be carried out on a monthly or routine basis for the purpose of ensuring proper and adequate operation of the treatment works. Inspections of the facilities are usually at least done annually. Monitoring of receiving waters is a program by all agencies to ensure compliance with standards. A continuing or intensified program to monitor effluents for certain parameters, such as phosphorus, should be developed. Samples should be collected sufficiently frequently and flow measurements made sufficiently accurately to ensure the statistical validity of the data, particularly so that loadings can be more accurately calculated.

SUMMARY OF SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

B.1. ESTABLISHMENT OF WASTE TREATMENT AND CONTROL REQUIREMENTS

In the United States, the Federal Water Pollution Control Act Amendments of 1972, October 18, 1972, established a National Pollutant Discharge Elimination System Permit Program (NPDES). The law is predicated on two national goals: the elimination of discharge of pollutants into the navigable waters by 1985, and interim attainment by July 1, 1983, of water quality which provides for protection of fish and wildlife and for recreation. In Illinois industrial discharges will be eliminated from the Lake Michigan Basin by 1975.

A notable exception of the Indiana enforcement program is the current case with United States Steel Company, Gary. The Indiana Stream Pollution Control Board's order requiring additional treatment facilities by December 31, 1972 was set aside. The Board has appealed this court decision and the matter is pending in the Indiana Supreme Court.

Industries in the Detroit River are subject to continual review by Michigan which may result in new remedial programs contingent on the guidelines and requirements of the new Federal legislation and maintenance of State water quality standards.

Minnesota has issued three stipulations to industrial sources on Lake Superior - Abex Corporation, Minnesota Power and Light, and Superwood Corporation, which are in various stages of completion. Recommendations to R. J. Reynolds have been fulfilled and U.S. Steel Corporation's were extended by Agency resolution to 1975 based on a completion schedule of the Western Lake Superior Sanitary District.

To date, the discharge of Taconite tailings from Reserve Mining Company at Silver Bay has not been resolved. Negotiations with the company are in progress.

The majority of the notable exceptions in New York are located along the Niagara Frontier. The delays are, in most cases, tied to a municipal treatment schedule.

Some Ohio industries, steel and chemical, have experienced some slippage in schedules, however all have corrective measures under construction.

In Canada the pulp and paper industry is a problem in Ontario's industrial pollution control programs in the Great Lakes Basin. Where the Ministry's requirements are not being met the industries are being pressed for adequate treatment requirements.

B.2. MERCURY AND OTHER TOXIC HEAVY METALS

Programs for the control of mercury and other toxic heavy metals exist in all agencies. However warnings of non consumption of fish exist in the Great Lakes and St. Lawrence River and additional surveillance work may be necessary to isolate sources of mercury and other toxic metals which may have a natural origin.

B.3. TOXIC PERSISTANT ORGANIC CHEMICALS

The State, Province and Federal Governments have programs for control and surveillance for toxic persistant organic chemicals. Most agencies are presently concentrating on increasing the effort in the identification of possible adverse effects of PCB's and phthalates in the aquatic environment.

B.4. THERMAL DISCHARGES

Most programs for the control of thermal discharges are monitored to determine if the discharge adversely effects the aquatic environment. Mixing zones vary from a radius of 300 feet to 1,000 feet and the zone temperature should not exceed the ambient temperature by more than 3^{o}F to 5^{o}F. Several agencies are presently investigating and assessing treatment practices, water quality standards and mixing zones.

B.5. RADIOACTIVE MATERIAL

The federal governments in both countries are responsible for regulating the operations of nuclear facilities. The states and province have surveillance and monitoring programs to assess radiation in the environment. Recently U.S. EPA was given the responsibility to develop criteria, assess technology and surveillance programs in the United States.

Coordination for the development of objectives for the Great Lakes is presently under way through an international ad hoc committee. Since the effects of very low levels of radiation over long periods, such as encountered from routine emissions of nuclear power plants, is virtually unknown, research to assess these effects should be conducted immediately.

B.6. MONITORING, SURVEILLANCE AND ENFORCEMENT

Most agencies require monitoring data to be submitted to them in order to assess the effect of the discharge in the environment or determine compliance. However, the frequency varies within agencies from quarterly to monthly submissions. The Federal Water Pollution Control Act of 1972 requires operational data to be submitted to EPA on a regular basis. A continuing program to monitor water quality affected by industrial discharges should be developed and include sufficient frequency at key locations and encompass the proper parameters.

C. EUTROPHICATION

Phosphorus removal programs for the states and province in the Great Lakes Basin appear to be presently adequate to meet the reduction of phosphorus loadings as agreed to in the Agreement. However, a critical review of reporting data and calculating the loads to the system should be undertaken to determine if the loading data is sufficient in terms of frequency, accuracy and representative of loads for a given time period.

SUMMARY OF SECTION D - POLLUTION FROM LAND USE ACTIVITIES

D.1. CONTROL OF PEST CONTROL PRODUCTS

In 1972, the U.S. amended their 1947 Insecticide Act (FIFRA), while Canada's regulations pursuant to their Pest Control Products Act became effective. The major thrust of these actions was directed towards classification, registration, development of disposal regulations and strengthening of enforcement policies. Provincial and state programs, to varying degrees, are in existance which encompass the regulation, monitoring and, in some cases, the licensing of persistant types of pesticides or any which may be potentially harmful to the environment.

Recognition has been given to the important role of transportation of pesticides by silts and sediments. Studies are under way to assess what impact this may have upon the aquatic environment. While limited monitoring has tended to indicate a reduction of concentrations in water, a more comprehensive study will be necessary to encompass all aspects of the problem.

D.2. CONTROL OF POLLUTION FROM ANIMAL HUSBANDRY

The U.S. Department of Agriculture has jointly funded a Rural Environmental Assistance Program with the States. The purpose of this program is to emphasize practices and priorities which result in general public and specific community-wide benefits with special emphasis on the reduction of agriculture related problems. This program has been discontinued effective December 22, 1972 due to Presidential budget reductions, other than those programs funded prior to this date.

All the states and provincial governments have existing programs which are directed towards reductions of nutrients and sediments from animal barnyards, feedlots, holding areas or similar sources from which the runoff constitutes a material pollution hazard. Key elements of these programs have been to solicit the farmers' cooperation and participation through hearings and individual consultations, provide financial and technical assistance, and keep farmers abreast of the latest technology available for reduction of pollutants.

D.3. DISPOSAL OF SOLID AND LIQUID WASTES

In Canada, municipal solid waste management is carried out within the framework of provincial legislation. For the Province of Ontario, certificates are issued to municipalities and industries with designated operational requirements which are reviewed at least annually.

U.S. solid waste programs are being carried out under the provisions of the Federal Solid Waste Disposal Act as amended in 1970. This act does not provide for Federal controls over solid waste management. However, the Federal Refuse Disposal Act of 1899 can be used to abate pollution from the source to any navigable waters. An additional program entitled "Mission 5000" was begun in 1970 to encourage improved solid waste management and close open burning dumps.

Most states require submission of plans for state approval and provide periodic inspection to ensure proper operation of solid waste disposal facilities.

Liquid waste disposal was not adequately covered in this report. Future and more intense consideration should be given to liquid land disposal methods, such as spray irrigation, etc. Similarly, a further compilation of deep well disposal projects and policies should be considered. The present approach generally is to discourage deep well disposal in favor of waste reduction and surface treatment.

D.4. NUTRIENTS AND SEDIMENTS

Contributions of nutrients and sediments can be broken into two major categories, rural and urban, plus combined sewer overflows and dredging. The latter two are discussed elsewhere in this chapter.

Rural conservation programs have been on-going for some time in all states and in the Province of Ontario. In the U.S., recent efforts have been made to promote an awareness among the agricultural community of the detrimental effects of soil erosion on water quality and to encourage remedial measures through State and Federal financial and technical assistance programs. An integral part of many of these programs has been directed towards stream bank stabilization and re-alignment.

The Ontario Ministry of the Environment has carried out several studies to determine relationships between land use activities and nutrient loadings. Similar studies, while not directed solely at the Great Lakes Basin, have been carried out under the U.S. Federal Research and Demonstration Grant Program. These also extend to studies of urban runoff.

Both Canada and the U.S. have programs directed at a reduction of sediment discharges to the water courses from construction activity.

SUMMARY OF SECTION E - POLLUTION FROM SHIPPING ACTIVITIES

Agencies of both the Canadian and United States Federal Governments are engaged in the investigation, development and/or promulgation of standards of vessel design and construction and operation related to the prevention of discharges of oils, hazardous materials and other wastes. It is anticipated that standards included in the IMCO sponsored International 1973 Marine Pollution Conference will form the basis for development of compatible regulations affecting vessels operating in the Great Lakes.

Canada has regulations forbidding discharge of oil and garbage into any Canadian waters. The U.S. Coast Guard has under revision proposed regulations affecting sewage from all vessels. The complexity of reaching agreement on standards by all government entities involved makes it unlikely that compatible regulations governing the disposal of vessel wastes will be adopted by the target date of April 15, 1973.

The Province of Ontario and all of the States except Pennsylvania have specific regulations which generally require holding tanks for controlling marine toilet waste discharges from pleasure craft.

The Province of Ontario and the States are generally succeeding in enforcement of their pleasure craft regulations. They have been dismayed by the fact that the U.S. EPA has promulgated much more lenient standards. The U.S. Coast Guard and the Canadian Ministry of Transport are attempting to develop a coordinated vessel waste enforcement program.

SUMMARY OF SECTION F - POLLUTION FROM DREDGING ACTIVITIES

Both Canada and the U.S. have developed criteria for classifying dredged spoil as polluted or unpolluted. Almost all of the heavily polluted spoil dredged from both sides of the Great Lakes are currently placed within diked areas or on land. Disposal of all seriously or marginally polluted spoil in this manner is expected to be accomplished in the near future.

In addition to the EPA and Corps of Engineers, the Sport Fisheries, Wildlife Services and States are involved in approving the method of final deposition of the spoil. Ontario Ministry of the Environment closely coordinates with other government agencies responsible for the protection of fisheries and land disposal.

SUMMARY OF SECTION G - POLLUTION FROM ON-SHORE AND OFF-SHORE FACILITIES

Regulations are in existence for oil and a variety of hazardous materials (defined for purposes other than polluting the aquatic environment) to which both Canada and the U.S. subscribe. The regulations for identification and placarding of containers and vehicles carrying hazardous polluting substances will be developed subsequent to the issuance of the regulation designating hazardous polluting substances.

The U.S. Coast Guard has issued regulations for vessels and oil transfer facilities. EPA parallel regulations for non-transportation related on-shore and off-shore facilities are estimated for promulgation in April 1973.

SUMMARY OF SECTION H - CONTINGENCY PLAN

Under the 1970 Water Quality Act, the EPA has executed a federally oriented contingency plan aimed at the abatement of pollution from petroleum products on the Great Lakes.

Responsibilities for maintenance of the Joint U.S. - Canadian

Contingency Plan have been reaffirmed by the Coast Guard and Ministry of Transport.

Several states have implemented, or are implementing, contingency plans for the control and cleanup of oil and hazardous materials. These plans vary from reliance on state facilities to emphasing participation by industry and various units of Government in a coordinated response system.

The Ontario Contingency Plan will be published in final form during the Spring of 1973 and will supplant the interim Province of Ontario Contingency Plan for spills of oil and other hazardous materials as published in May 1971. This plan places emphasis on Regional Operations Teams responsible for the actual implementation of field operations and is designed to complement other existing contingency plans from municipal to international.

SUMMARY OF SECTION [illegible] - HAZARDOUS POLLUTING SUBSTANCES

Under the Federal Water Pollution Control Act of 1972 Amendments, EPA controls the dumping of hazardous pollutants and levies unit penalties based upon toxicity, dispersivity, and solubility of the material in the receiving water. As directed by Section 311 of the Amendment, EPA continues to work toward late 1973 promulgation of regulations for the identification of hazardous substances and harmful quantities thereof. In addition, a number of EPA research programs are in progress to gain similar knowledge relative to petroleum products. Units for the removal of hazardous pollutants have been built under the EPA Research Grant Program.

Each state bordering the Great Lakes has implemented a program for the control of hazardous polluting substances. These programs are comprised of storage, transport, and use controls; discharge permit programs; containment permit programs; as well as inventories of use and discharge; either singly or in various combinations.

The Province of Ontario is continuing its investigations into the environmental effects of industrial chemicals. Reports have recently been published on toxicity and other effects of chemicals used in the mining industry and in chemical specialties. Investigations are proceeding into chemicals used in the pulp and paper industry.

IV - SECTION A - POLLUTION FROM MUNICIPAL SOURCES

SUBSECTION 1 - CONSTRUCTION AND OPERATION OF WASTE TREATMENT FACILITIES

UNITED STATES

Under the provisions of Title II of the Federal Water Pollution Control Act, as amended October 18, 1972, the Environmental Protection Agency is authorized to make grants to municipalities to assist in the construction of publicly owned treatment works. The maximum grant percent level was increased to 75% of the estimated eligible cost of the treatment works. The definition of treatment works was expanded when the law was amended to include, in addition to previously eligible sewage treatment plants, intercepting sewers and outfall sewers, sewage collection systems and methods or systems "for preventing, abating, reducing.... including storm water runoff or industrial wastes, including waste in combined storm and sanitary sewer systems." Implementing rules, regulations, and/or guidelines regarding the new eligibilities have not yet been developed.

Section 207 of the amended statute authorizes appropriation of funds in the amounts of $5, $6 and $7 billion for FY 73, 74, and 75, respectively. On November 28, 1972, $2 and $3 billion for FY 73 and 74 were allotted in accordance with Section 205 of the amended law. However, it should be noted that even though allotments were less than the authorized appropriations, the $2 billion allotted for FY 73 will result in most of the States tributary to the Great Lakes receiving greater allocations than they received from the same total allotted for FY 72. This results from the application of the amended formula for allocations per the statute which emphasizes distribution to the States on the basis of needs. Decisions as to annual allotments after FY 74 must await such developments as the study of cost estimates to be conducted in cooperation with the States, reports on the studies to the Congress and enactment of a law by Congress, as prescribed in Sections 205(a) and 516(b) of the amended Act. It is anticipated that municipal projects discharging to the Great Lakes basin will correspondingly continue to receive the majority of these increased funds to assist in the construction of needed facilities, and in every case emphasis will be placed on construction of municipal phosphorus removal facilities.

The establishment of construction and operating standards will be an across-the-board agency implementation responsibility - the amended statute sets forth many deadlines for individual requirements such as secondary treatment, industrial pre-treatment, effluent limitations, best practicable technology, best available technology, etc.

ILLINOIS

There are only seven Illinois municipal sewage treatment plants tributary to Lake Michigan. They are operated by the North Shore Sanitary District and are located in Waukegan, North Chicago, Lake Bluff, Lake Forest and Highland Park (three plants). Waukegan and North Chicago plants provide secondary (biological) treatment. The others provide primary treatment. All provide effluent disinfection in addition to disinfection of overflows of inadequately treated wastes during periods of rain or thaw.

The North Shore Sanitary District is now engaged in a $115 million construction program which when completed will divert all sewage effluent from the Lake Michigan watershed. Current construction scheduling indicates that completion of the total project will be in 1975.

The Metropolitan Sanitary District of Greater Chicago provides wastewater treatment facilities service for the incorporated area of Illinois within Cook County. The plants operated by the Metropolitan Sanitary District discharge away from the Lake Michigan watershed. The Metropolitan Sanitary District has a sewage and waste control ordinance which reads (annex A amended January 29, 1970) in part as follows:

> "Said water quality standards and criteria are applicable to the waters of Lake Michigan except that no sewage, industrial waste or other wastes of any kind may be discharged in the waters of Lake Michigan."

There are three military installations bordering the Illinois portion of Lake Michigan. Camp Logan, a state facility has abandoned the use of their treatment plant and is currently using a septic tank disposal system. Great Lakes Naval Training Center and Fort Sheridan are both served by trickling filter wastewater treatment plants. Both plants are operating at considerably less than their design capacity. Effluent from both facilities is disinfected. Plans have been made to connect both facilities to the North Shore Sanitary District system upon completion of the North Shore Improvement Program.

Illinois has required that all backwash water and settling basin sludge from water filtration plants receive adequate treatment prior to discharge to the lake. The fourteen water plants using Lake Michigan water are in various stages of improvement projects to comply with this requirement.

INDIANA

The responsibility for control of pollution from municipal sources is legally vested in the Indiana Stream Pollution Control Board. Section 10 of the Indiana Stream Pollution Control Law as amended provides that all plans and specifications for abatement or corrections of any polluted condition shall be approved by the Stream Pollution Control Board. All plans and specifications submitted to the Stream Pollution Control Board and/or the State Board of Health must be prepared by or under the supervision of a Professional Engineer legally registered in the State of Indiana, and must generally meet the minimum requirements as recommended in "Ten States Standards for Sewage Works."

A Wastewater Treatment Plant Operator Certification Law requires that the operation of all municipal wastewater treatment facilities be under the direct supervision of an operator that is certified under State Board of Health regulation HSE 30-R. The regulation provides for the classification of wastewater treatment plants and sets up the experience and educational requirements for operators. All licenses must be obtained by examination. There are provisions for revocation of licenses and fines.

MICHIGAN

Michigan controls pollution from municipal sources through the general provisions of the Water Resources Commission Act which requires permits for use of waters of the state and a Michigan Department of Public Health Act which requires construction permits prior to installation of sanitary wastes collection or treatment systems. All such facilities are constructed only after effluent restrictions have been established; to protect the waters of the state, to meet water quality standards, and to comply with any special provisions of State and Federal law, and after plans and specifications have been approved by the Michigan Department of Public Health. Plans are reviewed on the basis of the TEN STATE STANDARDS, design manuals of the Water Pollution Control Federation, other miscellaneous reference sources and the engineering expertise of the sanitary engineering staff of the two State agencies. Construction and operation are inspected by the Michigan Department of Public Health.

Michigan currently has 336 communities with recognized treatment facilities in the Great Lakes Basin. Nineteen percent of these are primary facilities, 71% are secondary facilities (including lagoons) and 10% are more advanced treatment or land disposal such as spray irrigation. Of these, 22 facilities are direct discharges to the Great Lakes waters with the remainder discharging to interior streams or ground waters. Michigan communities have committed $648 million to treatment facilities from FY 1968 to present which represents construction and/or expansion of 241 waste treatment facilities. Approximately 40% of these monies were provided by the state, 35% by the Federal government and 25% by the local agency. Eighty municipal projects are required to complete construction during FY 1973. However, many projects are now behind schedule due to lack of Federal funds for the projected Federal share of construction costs.

The operation of municipal facilities is inspected by the Michigan Department of Public Health and required to be under the control of an operator certified by that agency. Certification has been required by legislation since 1949 and is based on a written examination plus an evaluation of education, experience, and personal character of the applicant. Operators are required to submit monthly written reports on facility performance and effluent quality. Facilities are inspected at least annually by staff of the 10 Basin Engineers in the Department of Public Health.

Michigan has enacted legislation and is now developing programs to comply with the new Federal Water Quality Act as it applies to municipal facilities.

Notable Exceptions to Municipal Control Programs

St. Clair River: Clay township and Kimball Township in St. Clair County are under Commission Order to correct raw sewage discharges. Both townships have defaulted the Orders and were referred to the Michigan Attorney General for enforcement. The reason for default was lack of grant funds to construct facilities. Court has ruled in favor of the Commission on Kimball Township and set a new complete construction date of December 1973. Action on Clay Township is pending.

The City of Algonac and Ira Township were under Commission Order to construct secondary treatment facilities and phosphorus removal by June 1972. Project has been delayed due to lack of funds and grants. The City appeared for a hearing in October 1972, and new abatement dates are being negotiated.

The City of St. Clair was under Order to complete facilities by December 1972. This project is also delayed due to lack of Federal funding.

Detroit River: The City of Detroit is under Order of the Water Resources Commission to provide interim treatment facilities for BOD, suspended solids and phosphorus removal by December 1971, secondary treatment with 80% phosphorus removal by November 1973, 90% phosphorus removal by December 1975, and additional phenol removal by August 1976. The City has substantially completed the interim facilities and is complying with the BOD removal and disinfection requirements of the Order. Periodic compliance has been achieved with the phosphorus removal, but suspended solids are not meeting restrictions. The City is experiencing difficulty with sludge disposal.

MINNESOTA

The Minnesota Pollution Control Agency serves municipalities (state, cities, villages, sanitary districts, etc.), and private establishments in all aspects of sewage disposal system design, construction and operation and maintenance. Work consists of procedural assistance and guidance on the financing and provision of adequate sewage disposal systems, conceptual engineering report review, plan and specifications review for sanitary sewers and treatment works, operations and maintenance inspections, operator training and certification, administration of the federal (U.S. Environmental Protection Agency - EPA) and state financial assistance programs, and evaluation of monthly reports for compliance with Agency regulations and permit conditions.

There are eight municipal wastewater treatment facilities that discharge either directly into the Minnesota portion of Lake Superior or into the St. Louis River at its mouth. The actual discharge of these sources is about 22 million gallons per day; this serves a municipal population of about 113,000. Over 95% of the population in the Lake Superior area in Minnesota is served by sewers and wastewater treatment. Six of the eight sources have primary treatment and are under stipulation to provide secondary treatment and phosphorus removal; the secondary plants are under stipulation to provide phosphorus removal. Grand Marais and Two Harbors will begin construction in 1973. The basis for these requirements are Agency rules and regulations (1) WPC 25 on the classification of interstate waters including Lake Superior, and (2) 15, 26, and 28, which are water quality and effluent standards for interstate waters and disposal systems discharging to Lake Superior.

The Agency Compliance Schedule shows that all sources are to have expanded treatment in operation by the end of 1976.

Notable Exceptions to Municipal Control Programs

Lake Superior: Permits for the Minnesota villages of Grand Marais and Two Harbors were issued by the MPCA in early February 1973 following allocation of funds by the federal and state governments. Construction of tertiary sewage treatment facilities for these two municipalities will commence in April and May of 1973.

The four Duluth treatment plants have been given a time extension since the responsibility for wastewater treatment systems has been assumed by the recently formed Western Lake Superior Sanitary District (WLSSD).

NEW YORK

All known municipal sources have programs planned or under construction. The Monroe County Pure Waters Agency is the most significant point of progress and will have the 15 mgd NW Quadrant STW in operation this year. The 100 mgd City of Rochester STW is under construction. Both plants will include phosphorus removal to reduce phosphorus in the effluent to less than 1.0 mg/l.

Notable Exceptions to Municipal Control Programs

All of the municipalities in the Niagara River area were originally delayed in development of their improved waste treatment facilities until completion of Erie and Niagara County comprehensive sewage plans. Subsequent delays resulted in failure to obtain Federal and/or State approval before original grant funds were no longer available. New York State's justifiable requirement of pilot plant investigations of proposed phosphorus removal processes also generally slowed completion of final plans.

Following are some additional causes of delays at individual plants:

Lackawanna: The municipality has moved very slowly.

City of Tonawanda and Town of Tonawanda: Considerable time elapsed before the municipal officials reached an agreement to proceed with a joint treatment facility. This also delayed Spaulding Fibre which considered having their wastes treated by the municipalities.

City of North Tonawanda: Considerable time used in developing plans including pilot plant investigations of joint treatment with the Durez and International Paper Industries. These industries eventually decided to separately treat their wastes. The city also changed consulting engineers.

City of Niagara Falls: Development of a suitable treatment process to handle the complex mixture of industrial-sanitary wastes was extremely time consuming. This also affected the industries of Hooker Chemical, DuPont Electrochemical and Carborundum which also plan to have all or part of their wastes treated by the municipality. These items have been resolved and biddable plans and specifications developed on which a Federal grant offer was made to, and accepted by, the city.

City of Rochester (Durand-Eastman STP): Delays stem mainly from construction problems related to 3.5 mi. outfall.

OHIO

Ohio statutes require that municipalities and other public entities must have a valid permit for the discharge of effluents into waters of this state. It has been past practice to make the renewal of the permit contingent upon compliance with conditions. In this manner adequate facilities for the treatment of wastes to meet water quality criteria are required. Other statutes require that plans for proposed facilities receive the approval of the Ohio EPA before construction is undertaken. Approval of plans and specifications is based on meeting water quality criteria. Ohio policy is that all municipal waste treatment plants will provide a minimum of secondary treatment and disinfection of effluent. Higher degrees of treatment are required where the need is indicated. Other statutes provide the Ohio EPA the authority for general supervision of the waste treatment facilities. This supervision includes the requirement for a certified operator to be in responsibile charge of plant operations.

Notable Exceptions to Municipal Control Programs

The City of Cleveland; the City of Painesville and Cuyahoga County Sewer District #6 (Rocky River): Waste treatment projects are considerably behind schedules established as a result of the Lake Erie Enforcement Conference.

PENNSYLVANIA

There are municipal and non-municipal sewage treatment plants. All provide a minimum of secondary treatment.

Failure of on-lot disposal systems is common in the area due to water-tight soils and a high groundwater table, leading to many interim package plants throughout the area. All sewage disposal must have a permit, except as exempted by the rules and regulations.

Applications for permits are reviewed for all new on-lot disposal systems, all collecting sewers and all sewage treatment plants or modifications thereto. Applications are evaluated for conformance with appropriate design requirements as well as water quality impact. In the case of tile field or other land disposal methods, soils and hydrologic conditions are evaluated to protect groundwater as well as surface water.

Collecting sewer systems and treatment plants are evaluated for design, planning and water quality considerations.

The TEN STATE STANDARDS are generally used for design consideration.

Planning considerations follow the requirements of the Clean Streams Law and the Municipal Sewage Facilities Act, and the regulations adopted thereunder. In particular, these require that:

a. All municipalities must prepare and adopt a wastewater management plan.
b. Wastewater management should be considered on a watershed basis.
c. No permit can be issued unless it conforms to a comprehensive plan of wastewater management or in the absence of such a plan, presents the best mix of:
    i) Expeditious action to abate pollution.
    ii) Wastewater management economy.
    iii) Consistent with long-range needs.

The municipalities have prepared a wastewater management plan. This is presently being supplemented by a comprehensive water quality management study which will be completed by 1974.

Water quality considerations are evaluated along two fronts. First, overall evaluations for the area have already been conducted three times during the past seven years. The study mentioned above will do this again. Second, all applications for a permit for a new source or a modification of a source of discharge are evaluated for water quality impact. Water quality modelling techniques, together with field observations and biological surveys, are used to determine the adequacy of treatment as well as the adequacy of the models.

When a permit is issued, it specifies the conditions under which it will remain valid, including effluent requirements. Effluent requirements are frequently referred to in the applicant's documentation.

The City of Erie has the only municipal plant of more than one mgd capacity. Phosphorus removal will be installed before the summer of 1973. This will precede the full plant expansion.

WISCONSIN

Lake Michigan

The 93% of municipal plants (186 out of 200) which provide secondary treatment of domestic wastes serve, in terms of population, approximately 97% of the residents of the Wisconsin portion of the basin who live in sewered communities. It is Wisconsin's goal to bring both figures to 100% by the middle of this decade. Wisconsin, in almost all instances, is well beyond the critical stage of combatting gross pollution from uncontrolled discharges of raw human or industrial waste. Concern is with the upgrading of systems which, through age or because of the growth of the community they serve, are at or beyond the level of optimum operating efficiency. The refined atmosphere of control of chemical pollutants - phosphorus, pesticides, chlorides and the rest, is now the major objective.

Disinfection facilities are in operation at all plants in the basin.

Lake Superior

Of the six major municipal wastewater sources in the basin, progress in terms of construction of secondary treatment facilities has been made by five of the municipalities. The City of Superior is still exploring NEMDA interstate treatment arrangements; however, they have submitted plans for their own secondary treatment plant and phosphorus removal system and applied for financial assistance. All of the existing plants are providing disinfection.

Notable Exceptions to Municipal Control Programs

Lake Superior: City of Superior as noted above.

ONTARIO

The Province of Ontario has 222 municipal water pollution control plants in the Great Lakes Basin of which only 61 discharge directly to the Great Lakes or Interconnecting Channels. Some 65 municipalities are engaged in the development of sewage works programs to improve local sewage service in smaller communities in this province. The total treatment capacity in the basin exceeds 720 million gallons per day (mgd) of which about 520 mgd represents the capacity of systems discharging directly to the boundary waters.

The Ministry of the Environment is involved in many aspects of construction and regulation of municipal waste treatment plants in the province including definition of problem areas, guidelines for sewage collection and treatment process, stream or lake loading criteria, financing, design review and for project construction by Ministry-municipal agreement, construction supervision, control and operation. Surveillance and monitoring of all operational facilities, including training programs for plant operators, are important aspects of the province's supervisory program.

By 1975, control of phosphorus discharges from more than 200 municipal wastewater treatment plants serving some 4.7 million persons is expected to be in place. Phosphorus removal systems will be installed and operating at 75% of these plants by the end of 1973. This program is explained in detail in Chapter IV, Section C.

A number of municipalities are actively involved in improvements to sewage treatment programs.

Notable Exceptions to Municipal Control Programs

Lake Superior

The City of Thunder Bay: The City is served by two primary sewage treatment plants with a combined capacity of 10.0 mgd. Negotiations between municipal officials and the Ministry have led to a scheduled program of improvement. By 1975 a 24.0 mgd capacity treatment plant, financed under a Ministry-municipal agreement, is expected to be operational. It will be located at the existing Thunder Bay South sewage treatment plant site. The

Thunder Bay North plant will be phased out and utilized as a pumping station. Biological studies are presently underway to determine the nutrient removal requirements for the installation. Treated effluent is to be discharged eventually to the outer harbour area; however, an interim inner harbour outfall will be utilized until approximately 1980.

In addition to the above an extensive sewer interception program is presently being implemented in Thunder Bay. The Current River interceptor sewer has been extended to pick up the Clark Street sanitary sewer which discharged untreated sanitary wastes directly to the harbour area and will be further extended to pick up the Lillian Street sewer by 1976. With completion of the Kam River interceptor, it is expected that by 1980 all municipal wastes in the Thunder Bay area will be transferred and treated in the one central location.

The Township of Schreiber: Presently serviced by municipal septic tank and individual private septic tank systems. Pollution surveys of the community of 600 persons have shown that untreated domestic wastes are reaching storm sewers and causing adverse effects on water quality in the area.

Under the direction of the Ministry, a provincially financed program to construct a 0.3 mgd capacity extended aeration plant and sewage collection system is well underway. Final design has begun on the project and construction is expected to commence in 1973 with tentative completion in 1974.

The Township of Marathon: Pollution surveys have shown that the .25 mgd primary plant now serving the Township is hydraulically overloaded. With the assistance of the Ministry, municipal officials have hired a consultant to evaluate and propose a program to correct these conditions. At present a brief has been presented to the Ministry for review; however, no firm commitments or deadlines have been negotiated. A reasonable target date for this project would be 1975.

Township of Terrace Bay: The 5.5 acre lagoon serving Terrace Bay is in compliance with Ministry effluent criteria.

The Improvement District of Red Rock: This District, population 1,900 persons, is presently served by individual septic tanks and sewers.

Discharges of untreated domestic wastes reach the lake and impair its quality. A consultant has been hired by the municipality to evaluate the present system and is expected to submit a report to the Ministry before the end of 1972 outlining a corrective program.

The Township of Nipigon: The Township has hired a consulting engineer to investigate the feasibility of plant expansion. The proposal calling for a .36 mgd expansion to the existing primary facilities has been reviewed and accepted by Ministry officials. This improvement, expected to be completed by 1974, will bring the total capacity to .54 mgd.

St. Marys River

The City of Sault Ste. Marie: This major municipality on the St. Marys River is served by an 8.0 mgd primary sewage treatment plant operated by the Ministry. Construction of a 4.0 mgd extension is expected to begin in the spring of 1973 with completion tentatively scheduled for early 1974.

Lake Huron

In places where there is expanding municipal and industrial development, some impairment of water quality has resulted. The southern parts of Georgian Bay which experience impaired water quality are generally the result of expanded shore development which influences the local bacteriological and nutrient levels in the Bay. Water movement in Penetang Harbor and Midland Bay is somewhat restricted involving little interchange with Georgian Bay. Increased inputs of nutrients, particularly phosphorus have promoted growths of blue-green algae during late summer periods. Storm runoff due to sewage bypassing has also influenced the coliform level of Penetang Harbor. Nutrient removal is required at Penetang and Midland by December 13, 1973.

St. Clair - Detroit River System

Among the many municipalities in the Ontario part of the Lake Erie drainage system the city of Sarnia and the city of Windsor nutrient control programs are scheduled for completion in 1973.

Lake Erie

Town of Leamington: The town is served by a 2.05 mgd primary sewage treatment plant constructed in 1964. The municipality has hired a consulting engineering firm to study sewer separation and improvements as well as the requirements for a higher degree of treatment. This report is expected to be available shortly.

Village of Port Rowan: The village has a Provincial Project under development involving a 21 acre seasonal discharge lagoon and sewage collection system. Construction is almost completed and operations should commence early in 1973.

Niagara River

Town of Fort Erie: The Town of Fort Erie is serviced by a 1.8 mgd primary type sewage treatment plant. Because of infiltration, the plant is hydraulically overloaded, however, sewage strength is extremely weak. An active program to reduce storm flows and infiltration problems is continuing and if successful, additional plans to receive wastes from other service areas will be approved. If unsuccessful, the municipality will be required to expand facilities in order to accept the additional wastes.

City of Niagara Falls - Chippawa: The Chippawa plant is a .3 mgd secondary type treatment plant originally built to handle wastes from the Village of Chippawa. The plant has become hydraulically overloaded and will be phased out of operation when trunk sewers are extended to this area. Wastes will be transferred to the Stamford plant when the trunk sewer extensions are completed in 1973.

Lake Ontario

City of St. Catharines: The City of St. Catharines, Port Dalhousie plant, is a 9.0 mgd primary type treatment plant built in 1969 and serving only a portion of the City. Plans for a secondary treatment addition have been approved and construction is expected to commence in 1973.

Regional Municipality of Niagara - Grimsby-Lincoln Sewage Scheme: The Grimsby-Lincoln sewage scheme is a Provincial project being developed to provide an activated sludge, 4.0 mgd plant to serve the areas of Vineland, Beamsville, Jordan Station and parts of the Town of Grimsby. Other small plants presently serving these areas will be phased out of operation when this program is completed. This is expected by 1975.

City of Hamilton: Construction of secondary treatment extensions to the existing 60 mgd primary plant is well underway with completion expected early in 1973.

Town of Mississauga: The Clarkson plant is a 2.25 mgd activated sludge treatment plant. Construction of the first stage of an expansion to a 24 mgd plant to be located beside the old plant is expected to be completed by late 1973. The initial capacity of the new extended aeration plant will be 6.0 mgd.

A 25 mgd extension to Lakeview plant has been completed recently, raising the treatment plant capacity to 37.5 mgd. Of the current 25 mgd sewage flow received at the plant, about 10 mgd comes from border areas near Metro Toronto. A further expansion to 50 mgd is expected with a tentative completion date of 1975.

Metropolitan Toronto: The Municipality of Metropolitan Toronto discharges approximately 233 mgd of treated domestic wastes directly to Lake Ontario. Ten million gallons per day are discharged to the Don River (North Toronto plant) and a further 10 mgd are conveyed for treatment at the Mississauga-Lakeview plant operated by the Ministry.

Phosphorus removal facilities are scheduled for operation by 1975 at each of the plants serving Metro.

Regional Municipality of York - York Central Sewage Scheme: This project when completed will resolve several pressing problems in the area immediately north of Metropolitan Toronto where the demand for future development has exceeded the assimilative capacity of the local receiving streams. The project includes a secondary treatment plant on Petticoke Creek near the shore of Lake Ontario with an outfall sewer extending into the lake. The proposed plant will be equipped with phosphorus removal and the usual effluent chlorination. The first stage of the plant is not expected to be constructed until after 1975; it will have a capacity of 25 mgd with an ultimate capacity of approximately 60 mgd. When operative, the trunk sewer system associated with the plant will extend into the York Central area, removing from service existing plants in the towns of Markham, Richmond Hill and Vaughan.

Pickering Township - Bay Ridges Plant: The Bay Ridges plant is serviced by a 1.25 mgd activated sludge sewage treatment plant. The plant will be expanded to 2.25 mgd in 1973 to handle the flows resulting from development in the area.

City of Oshawa: The City of Oshawa is presently serviced by a 7.5 mgd trickling filter plant that was built in 1955 and modified in 1965. The plant has just recently been expanded to 12.5 mgd and a new outfall was also constructed. Treated wastes are now discharged directly to Lake Ontario.

Town of Port Hope: The Town of Port Hope is presently constructing a 1.0 mgd extension to their activated sludge treatment plant. This should alleviate high flows which were hydraulically overtaxing the plant with the extension to be completed early next year. The total capacity of this plant will then be 2.0 mgd.

Separated Town of Trenton: The separated Town of Trenton is serviced by a 1.0 mgd primary treatment plant that was constructed in 1950. A provincial project is under development for the construction of a 3.5 mgd activated sludge sewage treatment plant. Completion of this project is tentatively scheduled for 1974.

City of Belleville: The City of Belleville has recently expanded their 3.0 mgd primary plant to 8.0 mgd with the provision of secondary treatment. This should alleviate the hydraulic and organic overloading which persisted at the plant before this expansion took place.

Town of Deseronto: The Town of Deseronto has recently constructed a .3 mgd activated sludge plant which is expected to correct undesirable water quality conditions resulting from the discharge of untreated domestic wastes.

Village of Wellington: Pollution surveys of the village have indicated that water quality impairment results from malfunctioning septic tanks and illegal connections to storm sewers. A proposal for a Provincially-financed 16 acre lagoon has been discussed between municipal and Ministry officials and is under development.

Kingston Township: The .833 mgd activated sludge treatment plant presently serving Kingston Township is scheduled for expansion. The extension will increase the capacity to 2.0 mgd and could be completed by 1974.

St. Lawrence River

City of Kingston: The City of Kingston is served by a 9.0 mgd primary sewage treatment plant constructed in 1965. A proposal submitted by the municipality would increase the capacity to 13.5 mgd by 1974. Phosphorus control at Kingston and all major sources on the St. Lawrence River will be required by 1975.

Town of Prescott: The Town of Prescott has recently completed the construction of a sewage system with primary treatment capacity of 1.0 mgd. It is expected that this facility will improve water quality in and around the vicinity of Prescott on the St. Lawrence River.

Village of Cardinal: The Village of Cardinal is serviced by two municipal septic tanks. One discharges directly to the St. Lawrence River while the other discharges to the Gallop Canal. Discussions between municipal and Ministry officials have laid the ground work for a provincial project to provide sewage treatment for this municipality. It has been proposed that a .33 mgd activated sludge plant be built. At present the program is proceeding on schedule and it is anticipated that the completion date will be sometime in 1974.

Waste Treatment Research

Flowing from the research studies under the Canada-Ontario Agreement and the many applied research projects undertaken independently by the Ministry a number of very promising developments have been made to improve management of wastewater treatment and land drainage. It should be noted that portions of this research are being carried out by private contractors and universities as well as by the governments.

IV - SECTION A - POLLUTION FROM MUNICIPAL SOURCES

SUBSECTION 2 - PROVISION OF FINANCIAL RESOURCES

CANADA

Assistance from the Federal Government for pollution control works has been made available to all of Canada since 1960 through the Central Mortgage and Housing Corporation (C.M.H.C.) under a Revision to the National Housing Act. The net effect is to provide long term loans at government interest rates for two-thirds of the eligible project value, and a subsidy of one-sixth of the value at the end of the re-payment period. The recent Canada-Ontario Agreement provides for an additional $10 million to be allocated for the accelerated construction of pollution control facilities in Ontario through the existing C.M.H.C. programme up to March 31, 1972, and total of $250 million up to December 31, 1975. Also up to $6 million is available for related research studies until December 31, 1975.

UNITED STATES

See IV. A. 1.

ILLINOIS

Illinois has passed a $750 million bond issue to augment the federal grant financial assistance programme for the construction of wastewater treatment facilities. Illinois provides grants of 25% of the construction costs. During 1971 a total of 105 state grant offers have been made in the State of Illinois while 49 federal grant offers have been made. The total amount of the offers were $58,745,000 of state money and $31,136,000 of federal grants. Of these, almost $40 million of state grant money has been made available to the Metropolitan Sanitary District of

Greater Chicago and the North Shore Sanitary District while almost $30 million of federal grant offers have been made to these agencies.

INDIANA

Numerous methods of funding water pollution control facilities are utilized by the municipalities in the Great Lakes Basin. A majority of projects were funded through the State and Federal construction grants program under PL660 with 50% Federal, 25% State, and 25% local matching funds.

Nine projects totalling approximately $15,167,234 in total project cost were completed in FY 1971-72. Another five projects totalling approximately $27,352,475 in total project costs were placed under construction in the same time period under the PL 660 program. A total of seven water pollution control projects having a total project cost of $17,355,152 have received State certification for FY 1971-72 construction grant funds.

Applications for twenty four municipal water pollution control projects for approximately $50,882,354 have been received from the municipalities in the Great Lakes Basin for FY 1972-73. The probability of those municipal projects with applications for FY 1972-73 receiving grants is dependent largely on the availability of Federal funds. The State of Indiana is presently operating on a pay-as-you-go basis so that State matching funds will not be a hinderance to the program. There are seven projects in the Great Lakes Basin eligible for FY 1971-72 grants with the total State matching requirement of $3,147,153. The State allocated $5.0 million to meet the expected first year grant payment.

Many of the municipalities within the Great Lakes Basin have taken advantage of financial aid programs administered through the Department of Housing and Urban Development, and for communities with population of 5,500 or less through the Farmers Home Administration. The larger cities such as Gary, Fort Wayne, South Bend, and Michigan City, have numerous local redevelopment projects now under construction which include local sewer separations. Construction of such sewer separation projects partly financed by the Department of Housing and Urban Development is expected to continue through the next year. Funds for the planning and engineering of water pollution projects are available through the State revolving fund on a non-interest repayable loan basis. The revolving fund provides a source of funds for the preliminary studies and final plans preparation for those communities which do not have the financial resources to initiate projects on their own.

MICHIGAN

In November, 1968, Michigan voters approved the issuance of State bonds in the amount of $335 million for the purpose of assisting local agencies in financing construction of pollution abatement facilities. This approval was followed by the enactment in mid-1969 of implementing legislation which divided the proceeds from the sale of the bonds into two separate funds; one of $285 million to provide grants for the construction of sewage treatment works and one of $50 million to provide grants for the construction of collecting sewers. Both funds are administered by the Water Resources Commission.

The State programme of grants for sewage treatment works was designed to accelerate the construction of such facilities and to qualify Michigan municipalities for maximum grant assistance under the provisions of the Federal Water Pollution Control Act, with the State providing one-half of the prospective Federal share. This plan left 25% of the cost of an eligible project to be borne by the local agency.

The State treatment works grant statute underwent significant changes late in FY 1971 upon enactment of Act No. 33 of the Public Acts of 1971. This amendatory legislation had two major purposes: (1) to eliminate State prefinancing of the Federal share after June 30, 1971, and (2) make certain changes in program scheduling to allow more time for processing applications. With State prefinancing of the Federal share out of the picture, FY 1971 projects were funded at the level of 39% Federal and 25% State.

The State treatment works grant program has recently undergone further significant changes in 1972. The major changes effected by new legislation are: (1) elimination of financial needs as a basis for determining project priorities; (2) adding collecting sewers to the definition of treatment works; and (3) limiting state grants to not more than 25% of eligible project costs and State-Federal combined total to not more than 90% of eligible project costs. These changes are necessary to keep Michigan's grant program compatible with revisions to the Federal grant statute.

In the 18 months following adoption of implementing legislation in July, 1969, the program resulted in 193 projects being placed under construction with State Financial assistance totalling $199 million. During the next 18-month period, between January 1, 1971 and June 30, 1972, only 46 projects have been or will be placed under construction with State Financial assistance totalling approximately $56 million.

In addition to the 239 previously funded projects, the Commission has a backlog of 208 applications for projects to be funded in FY 1973, or later. With the new Federal legislation, it is impossible to make an accurate prediction at this time of the number of projects to be funded in the coming fiscal year.

MINNESOTA

Minnesota provides a state matching grant of 25% of the eligible construction costs for all municipal projects which initiated construction after June 30, 1970, under Section 8 of the Federal Water Pollution Control Act.

Regulation WPC-34, Rules for the Administration of the Municipal Facilities Assistance Program, and the Minnesota State Water Pollution Control Fund establishes the administrative rules and the criteria used by the staff to determine eligibility and priority for grants and loans, and the disbursement of funds. The Federal Water Pollution Control Act Amendments of 1972 (enacted on October 18, 1972) will necessitate a revision in Minnesota statutes if state matching grants are to be provided to fiscal 1973 applicants. and those of subsequent fiscal years. The Agency Board has directed the staff to prepare legislation providing a 15% state matching grant.

NEW YORK

1. Lake Erie Basin: $21.4 million for six municipal construction

projects for water pollution control in operation or under construction. State grants of $6.4 million are committed to these projects which will have a design capacity of 9.6 MGD. There are also 4 projects listed under Title 2, Water Quality, of the Environmental Quality Bond Act of 1972 with an eligible project cost of $15.0 million which will provide a design capacity of 8.6 MGD.

2. Niagara River Basin: $80.6 million for six municipal construction projects for water pollution control in operation or under construction. State Grants of $24.2 million are committed to these projects which will have a design capacity of 188 MGD. There are also eleven projects listed under Title 2, Water Quality, of the Environmental Quality Bond Act of 1972 with an eligible project cost of $226.9 million which will provide a design capacity of 162 MGD.

3. Lake Ontario - St. Lawrence River Basin: $416.7 million for one hundred thirty nine municipal construction projects for water pollution control. State grants of $124.9 million are committed to these projects which will have a design capacity of 320 MGD. There are also 50 projects listed under Title 2, Water Quality, of the Environmental Quality Bond Act of 1972 with an eligible project cost of $200.4 million which will provide a design capacity of 95 MGD.

The Environmental Quality Bond Act of 1972, approved by the people of the State of New York on November 7, 1972, provides $650 million for construction of municipal water quality projects. These State funds and Federal funds authorized by the Federal Water Pollution Control Act Amendments of 1972 will provide construction grants for new projects that will be constructed under the second phase of the New York State Pure Waters Program .

Lateral Sewer Construction Aid

Chapters 1045 and 1046, Laws of 1970, established an addition to the State's Pure Waters Program to assist rural communities whose local economics and tax bases are insufficient to bear the burdens of the cost of construction sewage collection systems. This law was amended by Chapter 1162 Laws of 1971, to incorporate the factor of need and to clarify eligibility of communities for assistance under this program . This law as amended became effective April 1, 1971. Rules and regulations for implementing this program have been promulgated and applications have been distributed to eligible communities requesting same. This law provides State assistance in meeting the annual debt service payments for collection sewers under construction during the period April 1, 1965 to March 31, 1973.

OHIO

Ohio has an agency, the Ohio Water Development Authority, which assists political subdivisions and industries in financing pollution control facilities. This arrangement assures political subdivisions of obtaining the maximum Federal grants and provides the remainder of the cost of the projects as a loan. Financing is made available to industries as a loan.

PENNSYLVANIA

Pennsylvania provides construction grants in a program that is fully integrated with the federal construction grant program. This integration eliminates additional state administrative costs. State grants are about $10 million per year statewide. Priorities are established on the basis of pollution control and financial needs.

Municipalities receive 2% per year of eligible costs from Pennsylvania. Eligible costs are treatment and major conveyance construction costs, minus any construction grants.

WISCONSIN

Grants of 25% of construction costs are now available to municipalities on a direct payment basis as opposed to the 5 - 30 year contracts required by previous law. These funds, obtained through state bonding, can also be used in a broader support pattern than previously. In addition to financing treatment plants and intercepting sewers, state aid is available for separation of combined storm-sanitary sewers, for sewer systems installed to eliminate existing sources of pollution from private disposal units, and to assist in financing permanent treatment facilities installed as part of a federal demonstration project. A total of $144 million over a 10-year period is available for 25% grants under the provision of ORAP-200.

ONTARIO

Assistance from the Federal Government for pollution control works has been made available to all of Canada since 1960 through the Central Mortgage and Housing Corporation (C.M.H.C.) under a revision to the National Housing Act. Thereby, long-term financing is provided at government interest rates for 2/3 of the eligible project value, and a subsidy of 1/6 of the value at the end of the repayment period. The Canada/Ontario Agreement provides for up to $167 million of C.M.H.C. funds and $95 million of Ontario Treasury funds to be allocated on a cash flow basis for the construction of pollution control facilities in the lower lakes basin up to December 31, 1975.

Financing of sewage works in municipalities in the Upper Lakes basin is at present carried out in a similar manner through C.M.H.C., but on a project by project basis as these are developed year by year. Through the Ministry, Ontario acts as an agent for 30-year, low interest rate financing and construction and operation of sewage treatment facilities. Municipalities availing themselves of this program can discharge their liabilities by repayment of the funds and become owners of the facilities.

Area facilities designed to serve more than one municipality are subsidized to the extent of 15% of the capital cost. The Province of Ontario also provides financial assistance up to 75% of the capital cost of sewage facilities where these costs exceed $130. per lot with the remaining capital costs being amortized over a period of 40 years. This Provincial Scheme of financing allows the Province to own and operate the facilities in perpetuity.

IV - SECTION A - POLLUTION FROM MUNICIPAL SOURCES

SUBSECTION 3 - ESTABLISHMENT OF CONSTRUCTION AND OPERATING STANDARDS

UNITED STATES

See IV. A. 1

ILLINOIS

Illinois uses the recommended standards for sewage works by the Great Lakes Upper Mississippi River Basin Board of State Engineers as its basic design document. Also used is a technical policy document entitled, "Design Criteria for Waste Treatment Plants and Treatment of Sewer Overflows" which supplements the Great Lakes Standards, and in many cases provides for more stringent requirements. Illinois has a mandatory certification of operators program which is intended to insure that the facilities receive adequate operational attention. In addition the Agency staff perform frequent inspections of all wastewater treatment facilities to insure compliance with good operating practices and Illinois standards.

INDIANA

When completed, all new wastewater treatment facilities within the Great Lakes Basin are required to provide average BOD and suspended solids removal of at least 90%. In cases where the receiving stream is not sufficient to assimilate sewage treatment plant discharges a higher degree of treatment is to be provided so that the water quality standards of the receiving stream will be met. Phosphorus removal facilities of at least 80% removal are to be in operation at all municipal treatment facilities in the Great Lakes Basin, with population equivalents of 2,000 and greater, before the end of 1972. The Plan of Implementation requires that municipalities provide for the control of pollution from combined sewer overflows by the end of 1977.

The State requires each sewage treatment facility to submit monthly operation reports no later than the 10th day of the following month. A recommended schedule of laboratory tests is provided for each facility. The schedule indicates the type and frequency of tests depending on the size and treatment processes.

MICHIGAN

Michigan Act 245 is all-inclusive in regard to the authority of the Water Resources Commission to control waste discharges by Order of Determination procedures; however, the Michigan Department of Public Health also has certain authority and responsibility over waste discharges under other specific legislation. To avoid duplication of effort, the Water Resources Commission and the Department of Public Health have agreed that all the municipal discharges will be handled under the provisions of Act 98, Public Acts of 1913, as amended. This law requires communities to obtain construction permits prior to the installation of sanitary wastes collection or treatment systems. In an effort to coordinate the work of the two agencies, the Michigan Department of Public Health in all cases requests the assistance of the staff of the Water Resources Commission in developing effluent criteria recommendations for municipal discharges which are consistent with those adopted by the Commission for other dischargers throughout the state, and which will protect water quality standards.

The State's requirements for approval of engineering plans for construction of municipal, industrial, and commercial waste treatment facilities are extensive and thorough. Plans are reviewed on the basis of ten State standards; design manuals of the Water Pollution Control Federation; data obtained from State, regional, national, and international pollution control meetings and conferences; and the knowledge, experience, and general expertise of the sanitary engineering staff of the two agencies reviewing the plans for these facilities. In addition, compliance with the "Federal Guidelines, Design, Operation and Maintenance" is obtained on design prior to approval and issuance of the construction permit. When new and innovative treatment techniques are proposed by municipal dischargers, it is the general practice of the State agencies to require pilot plant verification of design parameters so that there is every reasonable opportunity to insure that the facilities, if constructed in accordance with the plans and specifications and if operated with reasonable care, will produce an effluent in accordance with the requirements specified for that discharge. The approval of the technical staff of the Environmental Protection Agency is sought for new treatment techniques.

MINNESOTA

In review of engineering reports and construction plans and specifications, Federal Guidelines Design, Operation and Maintenance of Wastewater Facilities - U. S. Environmental Protection Agency, Recommended Standards for Sewage Works - Great Lakes - Upper Mississippi River - Board of Sanitary Engineers (commonly referred to as "Ten State Standards") are used as the general standard basis.

Until recently, Minnesota operated under a voluntary certification program for wastewater treatment plant operators. The 1971 legislature enacted a bill that required mandatory certification for municipal operators. Subsequently a Certification Board was appointed by the Governor and rules and procedures to administer the law were adopted. An important section of these rules and procedures provides that in addition to requiring the operator responsible for the treatment facility to be certified, the collection system operator must in certain instances also be certified. There are provisions for the conversion of voluntary certificates to the mandatory program. Over 700 operators are or will soon be certified under the new program. Industrial operators may still be certified on a voluntary basis.

The Agency offers a number of courses to all operators; these include the Operator Institute, regional training schools, laboratory training course, Activated Sludge Workshops and Pond Operator short courses. The Agency is seeking to expand its staff and funding in order to increase the effectiveness of this program.

NEW YORK

A minimum of secondary treatment is required and, in addition, effluent must meet water quality standards adopted by the State of New York which standards comply with IJC water quality objectives. The state provides operation and maintenance grants in the amount of 1/3 the operating cost of a municipal treatment plant providing effluent requirements are met. In addition to stream water quality standards, specific effluent limits are issued in terms of both mg/l and total pounds per day for specific contaminants. Sampling is done regularly by the owner (municipality) and at least annually by state personnel.

OHIO

Plans for all public and industrial waste treatment facilities must be approved by the Ohio Environmental Protection Agency prior to construction. Evaluation of the design for municipal facilities is based on the Great Lakes and Upper Mississippi Board of Review standards for design and upon predicted ability of the facilities to produce an effluent which will not violate established water quality standards. Industrial treatment facility designs are judged on the basis of standard engineering practice, parameters determined by pilot plant operations, and compliance with water quality standards.

Ohio regulations require that treatment plants serving a population equivalent of over 250 must have a certified operator in responsible charge. Frequent inspections by the engineering staff of the Ohio EPA are made to assure that optimum operation and maintenance is provided for municipal and industrial waste treatment facilities.

PENNSYLVANIA

There are no inflexible construction standards for municipal treatment in Pennsylvania, although deviations from the "Ten States Standards" or any other applicable reference must be substantiated on the basis of sound design principles. Frequently, major deviations from standard design principles must be backed by a performance bond to safeguard public expenditures.

In general, the "Ten States Standards" are followed.

Operating standards are defined by Licensing Requirements and

Permit requirements (see above).

WISCONSIN

Wisconsin follows the "Recommended Standards for Sewage Works" by the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers.

ONTARIO

In implementing its water quality control program, the Ontario Ministry of the Environment establishes water quality standards which are designed to restore and preserve water quality for future use. Requirements for municipal and industrial waste effluents and, where applicable, land drainage are established by the Ministry on the basis of satisfying the water quality standard. In general, effluent controls incorporated into design and construction are based on application of the best practicable treatment technology to the individual discharge tempered by consideration of receiving water quality.

During the program of sewage plant expansion or modification in the municipality it is necessary that certain standards in design as well as construction be maintained. In the Province of Ontario all sewage treatment programs, regardless of the means of financing, must be reviewed and approved by the Ministry before being constructed. This assures consistant design practices and also allows control over construction and operating.

The Province of Ontario offers a comprehensive series of courses to sewage treatment plant operators. The courses are designed to teach the operator basic concepts of sewage treatment, to stimulate interest in his field and to acquaint him with the latest innovations and technology development in the waste treatment field. The courses are a mixture of lectures and practical workshops, often carried out at the sewage treatment plant. Each operator receives a certificate at the end of each course.

IV - SECTION A - POLLUTION FROM MUNICIPAL SOURCES

SUBSECTION 4 - OVERFLOWS FROM COMBINED STORM AND SANITARY SEWERS

CANADA

By Article V, Paragraph 1(a), the Canada-U.S. Agreement on Great Lakes Water Quality, one of the potentially most costly control measures to be carried out will be to curtail pollution from municipalities with combined storm and sanitary sewers which overflow, carrying raw sewage to the Lakes. Separation of the sewer system would cost an estimated $7 billion in the U.S.A. and more than $1 billion in Canada in the lower Great Lakes Basin.

In Canada a literature review has been completed which suggests several potentially profitable approaches. Additional resources applied to this program over the next four to five years promise to yield substantial benefits in reducing the costs of tackling this pollution source and will allow Canada to take advantage, for Canadian conditions, of extensive research on this subject in the U.S.A.

It is planned by DOE to develop technology and demonstrate abatement of pollution due to combined sewer overflows by awarding a number of contracts to study --

(1) reduction in pollution load by providing storage on the system,

(2) a fluidic type regulator for control of flow in diversion chambers,

(3) high speed treatment using a screen and a centrifuge,

(4) hydrology of urban runoff to sewer systems to minimize flows, and

(5) novel systems or measures for the control of pollution from combined sewer overflows.

Additional research programs will also be sponsored from funds available under the Canada-Ontario Agreement. A Working Group on Combined Sewers of the Technical Committee is presently developing a framework for Canadian research related to pollution due to combined sewerage systems. Contracts will be let in 1973-74 in keeping with the agreed upon framework.

UNITED STATES

See IV. A. 1.

ILLINOIS

As indicated previously the North Shore Sanitary District is engaged in an extensive construction program which will include diversion of all overflows and combined sewer discharges from Lake Michigan. These projects are scheduled for completion in 1975. As an interim measure, the overflows are disinfected prior to discharge. State Water Pollution Regulations require treatment of all overflows by December 31, 1975. Construction of new combined sewers is prohibited.

INDIANA

The State established a schedule for correction of combined sewer overflows for municipalities in Lake Michigan Basin. The City of Whiting is planning a combined overflow detention pond to retain overflows that will be pumped out later for treatment. The construction of sanitary and storm sewer separation for the Robertsdale Area of Hammond and disinfection of storm water discharge to Lake Michigan is well underway. On September 30, 1971, the City of Gary was required by a Stream Pollution Control Board order to complete control facilities of Broadway combined overflow by the end of 1972.

The selection of control methods are made on engineering evaluation after investigating alternate methods. The State does not stipulate any one method for control. Any method selected must be capable of producing an effluent that will meet stream water quality standards after dilution.

MICHIGAN

The Michigan Water Resources Commission has recognized the problems of temporary degrading of water quality due to combined sewer overflows. A major staff program goal is the abatement of pollution from this source through three program components.

1. New sewerage systems are to be developed on the basis of separate sewers for storm water and sanitary wastewaters.

2. Whenever feasible, separated sanitary wastewater systems are not to be discharged into existing combined systems. If connections are made, control facilities must be constructed on the combined system to meet and maintain water quality standards.
3. In those areas where non-compliance with standards is determined to exist as the result of overflows, control facilities must be established no later than June 1, 1977.

The control date of June 1, 1977 was first established in Michigan's interstate water quality standards which were adopted in June 1967. Program developments may call for a reassessment of this abatement date due to technological difficulties and financing problems. The Water Resources Commission has requested staff to evaluate this goal with respect to over-all program needs with particular consideration given to total funds available for pollution abatement. With a set limit on funds, the Commission hopes to evaluate the cost of effectiveness of combined overflow control as compared to further control of dry weather discharges. One study program is already underway in south-east Michigan and the Commission expects to undertake a state-wide assessment of this problem. It is expected that the Commission will make a decision of program direction by early to mid-1973.

MINNESOTA

Agency rules and regulations and the present abatement program require the correction of sewer system overflows. This may be accomplished by various means, i.e., sewer separation, retention and off-peak return basins, sewer rehabilitation and replacement, and various combinations, depending on the most cost-effective solutions.

NEW YORK

Holding tanks and/or separation of sewers have been proposed as solutions to problems in several areas. Some sewers already have been separated as part of urban redevelopment projects. The Monroe County Pure Water Agency is constructing a 5-mile long, 16-foot diameter tunnel which will serve the dual purpose of an intercepter as well as temporary storm overflow storage from much of the city of Rochester with eventual treatment at the city sewage treatment plant.

OHIO

The permit program of the Ohio EPA is requiring municipalities with combined sewers to make studies of the problem resulting from overflows of these sewers and to develop programs of corrective measures with the objective of eliminating all detrimental effects on these overflows on water quality. Construction of new combined sewers is prohibited.

PENNSYLVANIA

As mentioned above, the major violation of standards noted in the monitoring program occurs from overflowing sewers.

At present the control program is related principally toward protection of the Presque Isle beaches and minimization of overflows during dry weather. Upon completion of this treatment plant expansion at Erie (late 1973 or early 1974), dry weather overflows will be eliminated.

Elimination of combined sewer overflows has not been studied with sufficient detail to determine costs or effects.

For over 20 years, Pennsylvania has not approved new combined sewers.

WISCONSIN

With the exception of Oshkosh and Oconto, municipalities in the upper portion of the basin should have no difficulty achieving sewer separation by the Conference deadline of 1977. Earlier timetables have been set under state order for some communities, and within the next 18 months it is anticipated that Green Bay, De Pere, Kaukauna, Clintonville, Ripon, Shawano and Sheboygan will have their separation projects completed. Appleton and Oconto Falls have already met this objective.

In the lower portion of the basin, Port Washington has essentially eliminated its combined sewers; Milwaukee, Kenosha and Racine have demonstration projects underway which may provide alternative solutions to the problem which, in the older sections of these cities, is quite severe and difficult to correct through reconstruction.

The plan developed by the Southeastern Wisconsin Regional Planning Commission for the Milwaukee area recommends the construction of deep-tunnel storage for combined sewer overflows. During periods of wet weather the excess would be stored in these tunnels and, as treatment plant capacity permitted following the storm, would be pumped out for treatment. The City of Milwaukee has endorsed the plan and it is presently being reviewed by the Milwaukee Metropolitan Sewerage Commission.

Demonstration projects at Racine and Kenosha involve the concept of auxiliary treatment. In the Racine project, screening and air flotation units will be located at the sewer overflow outfalls. Additional activated sludge treatment units are being provided at the treatment plant site in the Kenosha project.

As the waste treatment plant improvement effort progresses --and it is believed that adequate facilities can be provided in all instances by 1975 within the basin -- there is no doubt that greater emphasis can and must be placed on overcoming deficiencies within collection systems. Clear water intrusion remains a problem even where sewers have been separated and the elimination of bypasses is essential.

ONTARIO

In 1971 the Canadian Government and the Province of Ontario entered into an agreement to encourage the abatement of pollution in the Lower Great Lakes System. One of the considerations in this program was research on the combined sewer overflow problem. In Ontario, these are sewers installed prior to 1957. Since that date all sewerage system installations were comprised of separate storm and sanitary waste carriers.

Studies have been carried out in a number of Ontario municipalities, which have resulted in the adoption of long-term programs in some cases, and installation of immediate control measures in others. In 1965, the City of Toronto began a $150 million, 25 year sewer separation program designed to eliminate 50 to 70% of the storm water from the combined sewer system. Other municipalities have similar programs providing some degree of combined sewage overflow containment. The high cost of sewer separation, the disruption of the community during construction and the lack of adequate data on the adverse affects of the overflows in comparison with storm water are some of the factors encouraging the consideration of alternative solutions to sewer operation in older systems.

Funds have been provided under the terms of the Canada/Ontario Agreement to assess the broad implications of storm drainage and the technology available for containing or treating overflows from storm and combined sewer systems. At this time, it appears that there is no universal solution to the problem. A number of water quality parameters must be considered. The conditions in each municipality resulting from the effects of overflow discharges on receiving waters will have to be assessed.

The Ministry intends to conduct research on the application of screening devices to concentrate overflows and sewage plant bypasses caused by storms with subsequent return of the material to the sewage system for treatment. The prospects for use of this device for effluent polishing will also be examined.

A joint study by the Government of Canada and the province will be undertaken to evaluate available information and data needs for projects aimed at mathematical modelling of existing combined sewer systems.

IV - SECTION A - POLLUTION FROM MUNICIPAL SOURCES

SUBSECTION 5 - MONITORING, SURVEILLANCE AND ENFORCEMENT

UNITED STATES

Municipal Waste Inventory

The Data Management Section of EPA maintains a municipal waste inventory which includes: degree of treatment; description of facility, discharge data; and population data. This information is taken from the Operation and Maintenance Program records, published reports, orders and by inspection of State file. Permit applications will become a major source of information for the inventory.

Permit Monitoring Program

(Under the Water Quality Amendment Act of 1972)

Operation data required by the permit program will be submitted on a regular basis and will be entered into the computerized inventory. Data will be compared to "Permit" conditions in order to determine compliance.

Monitoring

Both municipal and industrial sampling have been conducted by EPA on a broad scale for those facilities which are suspected to be in violation of effluent guidelines or water quality standards.

ILLINOIS

Illinois field surveillance activities are divided into major drainage basins with field personnel responsible for investigations and inspections of point source discharges within that basin. They maintain a weekly water quality surveillance program of the 31 beaches within Illinois in addition to routine water quality monitoring of the intake water at twelve water filtration plants.

In addition to the Agency's activities of monitoring, it requires submission of monthly reports of operation of all point source discharges. The discharger is required to analyze the effluents for compliance with the Illinois Water Pollution Regulations. As a general rule, municipal facilities are required to report bio-chemical oxygen demand, suspended solids, total phosphorus as P, and the heavy metals that have been determined to be present in their wastes.

Illinois requires approval for construction and operation of all point source discharges prior to issuance of a permit. The staff review data for technical completeness and for compliance with State regulations.

INDIANA

Enforcement activities in the Great Lakes Basin have received the highest priority and action has been taken against almost all municipalities in the basin which have not proceeded to voluntarily comply with the State's Plan or Implementation and Enforcement Conference Requirements.

All municipal wastewater treatment facilities within the Great Lakes Basin are required by State regulations to submit monthly reports of operation to the State Board of Health for review. The reports of operation are reviewed by the staff to insure that the treatment works are operating satisfactorily. The monthly operational reports are kept on file at the State Board of Health and are used in enforcement proceedings.

Routine inspections of municipal wastewater treatment facilities including sewage regulations and combined sewer overflow structures are conducted by members of the State Board of Health staff. The staff engineers are also available for consultation with plant superintendents regarding the operation of the treatment facilities.

MICHIGAN

Michigan municipalities are required to be under the supervision and operation of an operator certified by the Michigan Department of Public Health. These operators are required to submit monthly reports describing the performance of the treatment facilities as well as the quantity and quality of the outfall. Periodic plant visits are conducted by the Basin Engineers of the Michigan Department of Public Health to inspect operation procedures. In addition, waste surveys of the outfall are conducted on a periodic basis, usually in conjunction with a comprehensive basin study. Enforcement action is taken, when needed, through the provisions of the Water Resources Commission Act.

MINNESOTA

The current Agency monitoring program consists of stream monitoring and effluent monitoring efforts. The stream monitoring or water quality sampling program includes the routine collection of water samples from selected rivers and lakes, and the analysis of these samples for over 60 parameters of water quality. This program has been operational since 1953 with periodic adjustments in sampling locations to adequately monitor the significant waters of the state; presently, there are eighty-three sampling stations at which samples are taken monthly. In the Lake Superior area, there are ten water quality monitoring stations; two are located on the St. Louis River (51.9 and 19.1 miles from the mouth) and two are located along the shore of Lake Superior at Grand Marais and Silver Bay. There are six on a traverse of the open waters of Lake Superior.

All sewage disposal systems are required to submit monthly operation reports. The parameter and frequency of analysis to be performed varies with the particular class of treatment facility.

Presently, treatment facilities are inspected once every 1½ to 2 years. Through additional authorized personnel which have not been hired, it is the intention to inspect all municipal sewage disposal systems at least once every year.

Enforcement activities for municipalities involves Agency standards, orders, stipulations and implementation schedules using legal action where necessary. Often, however, mutually agreeable corrective actions and programs are agreed upon.

Implementation

The implementation plan for interstate waters requires those responsible for waste disposal systems operation to:

1. Obtain effluent discharge permits.
2. Provide a report outlining the known or estimated effluents as well as the treatment works required to improve effluent quality to required standards.
3. Provide regular monthly reports on specified effluent characteristics.
4. Provide quarterly progress reports.
5. Provide major improvements as required within certain dates.
6. Construct and operate required treatment works by specified dates.

This implementation procedure applies principally to conventional sewage and industrial wastes; however, similar requirements are specified for combined sewer systems and other wastes.

The Enforcement Plan for interstate waters includes requirements for appropriate in-depth studies, engineering reports, construction plans and specifications, financial data, and information on the start and completion of construction of required facilities. In unusual circumstances, the Agency may grant variances for the continued operation of the existing system during interim design and construction.

Failure of a municipality or an industry to comply with the Implementation and Enforcement Plan can result in revocation of the discharge permit and authorization of appropriate legal action by the Attorney General. Monthly surveillance reports from the dischargers, plus periodic operational checks on facilities and independent monitoring of effluent and stream water quality by Agency staff, help to assure proper compliance.

The Agency and its Water Quality Division staff work cooperatively with the U.S. Environmental Protection Agency and with adjoining states to enforce the interstate water quality standards. Since July 1970, Federal-State Enforcement Conferences on Lake Superior and its tributary basin have been held in Duluth (e.g. August of 1970, January 1971, and April 1972).

A similar implementation and enforcement plan exists for the state's intrastate waters as well. There are three basic types of enforcement actions which the Agency utilizes.

1. Orders: Issued either by the Agency, subsequent to public hearing, or by a court, subsequent to commencement of a lawsuit. The order is issued in those cases where mutual agreement cannot be reached with the alleged violator.
2. Stipulations: Involving a mutual agreement between the Agency and a party in alleged violation of Agency laws or regulations. The terms of a stipulation are obligatory upon the discharger; non-compliance with a stipulation can result in direct court action.
3. Recommendations: Courses of action suggested by the Agency and its staff which are voluntarily accepted and implemented. In cases of non-compliance, the Agency resorts to the more formal stipulations, litigation and orders, as may be required.

Increasingly, the Agency has resorted to the stipulation as a more formal and binding type of enforcement tool. The Agency Board has authorized the Executive Director to proceed with litigation in the event that voluntary agreements cannot be effectively negotiated.

NEW YORK

In order to obtain the O & M grant, municipalities must submit operational data to the Department of Environmental Conservation. One of the objectives is to provide two (2) inspections per year by state engineers. At least one annual inspection is required for the O & M grant. If violations of stream quality are found, administrative fines and court judgements may be entered against the municipalities. If lesser violations are found, the O & M application may be denied. The withholding of grant funds has proven to be an effective tool in securing adequate operation.

OHIO

Monitoring and surveillance of municipal waste treatment facilities is provided in two ways. The filing of a detailed operating report, including analytical data, on a monthly basis, is required. Plant inspections are made at least annually and oftener if indicated by performance. It is planned to increase this frequency.

The Ohio Water Pollution Control Law provides for enforcement action with appropriate penalties. Violations of findings and orders are referred to the Attorney General for court action.

PENNSYLVANIA

This embodies a multitude of varying activities, many of which overlap. Not only is primary agency activity involved, but the entire interested community can be, and is. Pennsylvania is actively involved. Only major elements of this activity are described below.

DER and ECHD

Conduct routine inspections; evaluate new proposals; sample routine sampling sites; evaluate overall conditions; respond to complaints; carry forth nearly all enforcement.

Pennsylvania Fish Commission

By a long-standing executive agreement, uniformed agents of the Pennsylvania Fish Commission are authorized agents for collection and presentation of evidence relating to violation of the Pennsylvania Clean Stream Law. These agents are trained by Fish Commission and DER personnel. The Fish Code also prohibits pollution and adds to the enforcement options.

Organized Sportsmen

Organized sportsmen, particularly the hunters and the fishermen, have been more concerned about our environment for a longer time than any other organized group.

These, including the organizations that have come later in stature and/or in time, represent a solid foundation for, if not the Genesis of, most current environmental law.

Through the Watershed Association seminars, the Citizens Pollution Patrol, and periodic contact with those associations, Pa. DER, the Pa. FC and the ECHD have not only kept abreast of problems but have increased the amount and value of concerned citizen response to pollution and water quality problems.

As a result of this widespread and multi-faceted interest, violations are frequently reported.

Enforcement

Enforcement consists of four basic types of actions, as follows:

1. Administrative Action - This results from findings of surveillance or changes in the law or regulations, and is initiated by a notice of changes in law or regulations or a notice of findings in violation. A permit may be revoked as a result of administrative action. Most enforcement actions are administrative.
2. Equity Actions - These are always filed in a court of appropriate jurisdiction and are filed to make a person stop polluting or stop an activity that may cause pollution. They may be filed in addition to or in concurrence with Compliance Actions which make the discharger comply with requirements. Equity actions are instituted principally against major violators who have ignored the law.
3. Criminal Actions - These can be initiated against any obvious violator of the law. They have been used largely against small violators since judges are reluctant to impart maximum fines. Equity action is most often used against major violators.
4. Civil Penalties - Notwithstanding all other penalties, civil penalties, subject to lien on property, can be assessed. These can amount to as much as $192,000.00 per year for each discharge.

WISCONSIN

Wisconsin has been divided into 28 major drainage areas. A stream survey program has been discussed whereby each drainage basin is studied on the average once every four to five years. Stream surveys have consisted of locating all possible sources, taking appropriate samples and preparing a formal report to be presented at a public fact finding hearing. Abatement orders are issued on the basis of the drainage basin surveys. In the event that the orders are not obeyed, Section 144.536 requires that all such orders shall be enforced by the Attorney General and that the County Circuit Court, where violation of such an order has occurred in whole or in part, shall have jurisdiction to enforce such an order by injunctional and other relief appropriate to the enforcement of the order.

Since 1961, Wisconsin has also had a continuing stream quality monitoring program to determine the water quality of our major streams. Samples are taken on a monthly basis in order to evaluate changes in water quality throughout the year. Recently, automatic monitoring stations have been established on the Lower Fox River. Parameters are measured hourly and transmitted to Madison and stored on computer tape.

ONTARIO

In evaluation of operation of municipal waste treatment facilities in Ontario, monthly samples of the influent and effluent from each water pollution control plant are analyzed at Ministry Laboratories for BOD, Suspended Solids, Total Phosphorus, and Total Phosphorus and Total Nitrogen, etc. In addition to this, each plant is inspected at least once a year and the operation evaluated by Ministry staff. Special sampling programs have been set up at certain plants in order to assess parameters such as Total Solids, Dissolved Solids, Soluble Phosphorus, Ammonia, Chlorides and certain Heavy Metals. Effluent chlorination is mandatory from May to October each year and where water re-use practices are concerned, has been implemented on a year-round basis. Close contact is maintained between Ministry staff and municipal officials so that operational problems can be corrected as quickly as possible.

The Ontario Ministry of the Environment maintains surveillance of municipal treatment works discharges and major overflows through its recieving water monitoring program. Monitoring stations immediately downstream of discharges to tributary watercourses and in the vicinity of direct municipal discharges are sampled tri-weekly on tributaries, monthly on the interconnecting channels and bi-monthly in the lakes (the latter two during the ice-free period).

Intensive surveys have been carried out in many heavy use areas to determine the effect of municipal discharges on the receiving water as the first step in defining abatement requirements.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 1 - ESTABLISHMENT OF WASTE TREATMENT AND CONTROL REQUIREMENTS

CANADA

National effluent regulations incorporating the principles of "best practicable technology" have been developed for the pulp and paper industry, for mercury discharges from the chloralkali industry, and for the petroleum refining industry. Regulations are under development for many other industrial sectors. The national effluent regulations which represent minimum levels of control to be implemented across Canada are promulgated under the aegis of the Federal Fisheries Act and limit effluent losses as a function of production units.

The national regulations are being developed by a joint Federal/Provincial/Industrial task force in order to quantify "best practicable technology" for any given industrial sector. This type of cooperative approach has been successful to date and, through maximum participation of all concerned parties as well as through consultations with experts in Canada and abroad, has resulted in realistic yet stringent environmental protection measures. More stringent levels of control may be imposed as required by local or regional conditions to provide adequate environmental protection.

The Canadian Federal Government recognizes that both the Federal and Provincial Govermnents have shared jurisdiction over water. The federal responsibilities are focussed in concerns about fish and other aquatic life, and navigation, as well as transboundary pollution problems. The national effluent regulations as with other federal environmental requirements will be implemented, wherever possible, through the coordinated action of the Provincial regulatory agencies. The Canada Water Act provides for joint Federal and Provincial Water Quality Management Agencies in designated areas.

UNITED STATES

Passage of the Federal Water Pollution Control Act Amendments of 1972 on October 18, 1972 established a National Pollutant Discharge Elimination System (NPDES) Permit Program and authorized the Administrator of the Environmental Protection Agency, after opportunity for public hearing, to issue a permit for the discharge of any pollutant or combination of pollutants to the navigable waters of the United States, including the territorial seas. This authority may be transferred to States having programs approved by the Administrator. The Act replaces and expands the Refuse Act Permit Program under authority of Section 13 of the Rivers and Harbors Act of 1899 to all discharges of pollutants to the navigable waters including those from publicly owned treatment works.

The law is predicated first on two national goals: the elimination of discharge of pollutants into navigable waters by 1985, and interim attainment by July 1, 1983, of water quality which provides for protection of fish and wildlife and for recreation.

ILLINOIS

The waste treatment and control requirements for industrial sources are identical to the municipal requirements. Illinois has only three industries of significance discharging into Lake Michigan. One is scheduled for connection to the North Shore Sanitary District and removal from the Lake Michigan Basin. The other two, both steel mills, are in the final design stages for total recycling with no discharge to the lake.

All other monitoring activities for industrial discharges are identical to the requirements for municipal discharges.

INDIANA

The responsibility for control of pollution from industrial sources is legally vested in the Indiana Stream Pollution Control Board.

Section 10 of the Law as amended provides that all plans and specifications for abatement or correction of any polluted condition shall be approved by the Stream Pollution Control Board.

The degree of treatment and control for industrial sources is determined on an individual basis whereby the quantity of waste flow, type of waste, size of receiving stream and downstream water uses are fully considered. In all cases the degree of treatment must be at least equivalent to secondary treatment. The applicable water quality standards are used to evaluate whether a proposed treatment system with its expected removal efficiencies will be acceptable.

A Wastewater Treatment Plant Operator Certification Law requires that persons in responsible charge of the plant must be certified. Certification involves the passing of a written exam and the meeting of the educational and experience requirements established in Regulation HSE 30R. The law provides that a license may be revoked or a fine levied if it is determined that the operator has engaged in actions of fraud or fails to perform his duties.

Regulation SPC 2 which became effective in 1953 requires that all users and handlers of cyanide and cyanogen compounds provide facilities to isolate these compounds from any drain connected to a water course. The general isolation requirements are for the construction of curbed areas around or pits beneath the tanks or handling area that will contain any leakage or spillage. There has been a very significant reduction in cyanide related fish kills and pollution incidences since full implementation of the law.

MICHIGAN

In Michigan control of pollution from industrial sources is through the general and specific requirements of the Water Resources Commission Act; Act 245, Public Acts of 1929, as amended. This Act requires industries proposing to make a new or increased use of the waters of the state to file a statement of intended use. The statement would indicate the amount of water used, its source, the proposed point of discharge, and the quality and the quantity of the discharge. Commission staff then prepare draft Orders of Determination which set forth the effluent restrictions needed to maintain the water quality standards of the receiving waters. This Order also requires that prior to construction of facilities, all plans and specifications must be approved by the Chief Engineer of the Commission.

Michigan has had a program of investigating and placing restrictions on all new or increased uses of the waters of the state since 1949. In May 1972, the Commission passed a motion that "pending the development of a national system of permits for waste discharges, the Michigan Water Resources Commission invites the Environmental Protection Agency to join it in a system of anticipatory controls under which outstanding Orders and Stipulations will be updated as jointly determined necessary to meet water quality standards and guard against unlawful pollution and under which Orders and Stipulations will be developed for all other discharges not presently so covered."

After the effective date of the 1972 amendatory act, a person shall not discharge any waste or waste effluent into the waters of this state unless he is in possession of a valid permit therefor from the commission. Compliance with the terms of an outstanding order of determination or final order of determination or stipulation with the commission that is in effect on the effective date of this 1972 amendatory act shall be deemed to meet the requirements of this section until the commission issues its permit. The commission shall condition the continued validity of a permit upon the permittee's accomplishment of such effluent requirements as the commission deems necessary to prevent unlawful pollution by such dates as the commission deems to be reasonable and necessary. If the commission finds that the terms of a permit have been, are being or may be violated, it may revoke the permit or grant the permittee a reasonable period of time in which to comply with the permit. The commission shall reissue a revoked permit upon a showing satisfactory to the commission that the permittee has corrected the violation by providing the necessary collection or treatment facilities and has adequately arranged for their operation.

This now permits Michigan to comply with all provisions of the new

Federal Water Quality Act. Program revisions will be made as Administrative Guidelines are developed by the Environmental Protection Agency.

Michigan initiated a mandatory industrial waste treatment plant operator certification program in 1970. Operators are examined and certified by the Michigan Water Resources Commission on the same general areas as the municipal operators plus additional emphasis on the operators specific knowledge of his own treatment system. There are currently 547 certified operators in the state which represents 97% coverage of industrial surface water discharges. A new law now extends the certification requirements to ground water dischargers. All operators are required to submit monthly reports on the quality and quantity of their waste discharge. Periodic inspections of facilities are conducted by Basin Engineers of the Michigan Water Resources Commission and additional extensive industrial waste surveys are conducted by Commission staff on a random basis.

Notable Exceptions to Industrial Waste Treatment & Control Requirements

Detroit River

All industries on the Detroit River were subject to specific control programs as the result of a joint Federal-State Enforcement Conference initiated in 1965. All industries have complied with the remedial programs specified as a result of the conference, however, continuing evaluation of the outfalls indicates further action is necessary in some cases. The companies which are currently being evaluated for additional programs are: American Cement Corporation-Peerless Cement; Anaconda American Brass Company; Detroit Edison-Rouge Plant; Wyandotte North Plant and Wyandotte South Plant; Ford Motor Company-Rouge Plant; Great Lakes Steel-Ecorse Rolling Mill and Blast Furnace Division; and Pennwalt Chemical-East and West Plants. New remedial programs may be required contingent on the guidelines and requirements of the new Federal legislation and maintenance of State water quality standards.

MINNESOTA

Minnesota has six industrial sources that are currently discharging directly to Lake Superior. These sources are required to file regular reports on effluent levels.

Waste Treatment Requirements

Engineering design evaluation and technical assistance is provided by the Agency. A preliminary report on plans and specifications for each new or improved industrial waste disposal facility are reviewed by an MPCA engineer usually early enough in the project to influence design and minimize alterations necessary to meet Agency requirements.

Preliminary and final review of disposal systems plans and specifications involves a comprehensive knowledge of current technology as well as specific familarity with the site and proposed operational characteristics of the facility. Once these reviews have been made, a permit for construction is granted.

Notable Exceptions to Industrial Waste Treatment & Control Requirements

Lake Superior

Three stipulations have been issued to industrial sources on Lake Superior. Abex Corporation has completed the terms of its stipulation and R. J. Reynolds has fulfilled a recommendation. The remaining stipulations are with Minnesota Power and Light and Superwood Corporation both of Duluth. Minnesota Power and Light is due to complete construction for expanded treatment; Superwood is in the construction phase of diverting its wastes to the City. A U.S. Steel recommendation is shared by the Western Lake Superior Sanitary District, and provides for expanded treatment; by Agency resolution, the deadline for construction was extended to 1975. To date the discharge of taconite tailings from Reserve Mining Company at Silver Bay has not been resolved. Negotiations with the company are in progress.

Control Requirements

One aspect of control is maintained through the permit application process. Usually the Agency staff is already familiar with the proposed facility from its evaluation of engineering reports, plans and specifications. A permit is only drafted whenever the expected effluent will meet all applicable standards.

Whenever a new wastewater source or modification of an existing source is proposed, a formal notice of application is prepared and distributed to all concerned parties. Comments are accepted for a period of

30 days. All objections to the proposed project are then closely reviewed.

Another aspect of control is through inspection; these inspections have in the past been fairly well limited to answering public complaints relative to an industry which appeared to be in gross violation of standards. This program will be expanded during FY 1973 and based on a regular inspection schedule.

NEW YORK

Prior to construction, the design for all proposed industrial waste treatment plants are reviewed by the State to ensure adequate treatment, optimum removal of contaminants, and assurance of meeting receiving water standards. At completion of construction, an inspection is made to ensure compliance with approved design plans and once in operation, the facility must constantly monitor the effluent for critical parameters and submit data to the State on a frequent basis. It is necessary to obtain a State Permit to Construct the facility and a Permit to Operate and Discharge from the facility. Renewal of the operation permit is considered on the basis of performance and meeting receiving water standards.

The Department has an enforcement program whereby all industries with no treatment or inadequate treatment are placed on a time schedule for the correction of their problems and all discharges to international waters are considered on the basis of International objectives.

Notable Exceptions to Industrial Waste Treatment & Control Requirements

a. Welch Grape.
b. Growers' Coop.
c. Semet Solvay Coke Plant.
d. Spaulding Fibre.
e. Durez (Division of Hooker Chemical).
f. Hooker Chemical.
g. DuPont Electrochemical.
h. Carborundum.

For associated explanations as to reasons for delay, refer to municipal section, IV.A.

OHIO

The permit and findings and orders program of the Ohio EPA requires the permittee to provide adequate treatment of all industrial wastes to meet established water quality criteria.

Notable Exceptions to Industrial Waste Treatment & Control Requirements

Some industries (steel and chemical) have experienced some slippage in schedules - all have corrective measures under construction

PENNSYLVANIA

A permit is required for all industrial waste discharges unless authorized by the rules and regulations.

Design requirements are not specified as in the case of municipal facilities; performance requirements are specified.

Planning and water quality evaluation are carried out the same as for municipal wastes.

Permits carry performance requirements, frequently by reference to the application and its supporting documentation.

Major industrial discharges not presently in full compliance are Hammermill Paper Company, Pennsylvania Electric Company, and Welsh (Grape) Corporation. Compliance by Hammermill and Welsh depends largely upon completion of municipal facilities expansion.

WISCONSIN

Basic statutory authority for control of water pollution is contained in Chapter 144 of the Wisconsin Statutes, specifically Section 114.025 which outlines the Department of Natural Resources purposes, powers and duties, Section 144.04 which requires every owner to submit complete plans of waste treatment systems for approval and Section 144.555 which requires any industry that intends to increase or discharge a new waste to surface waters to advise the Department in writing describing the steps which will be taken to protect surface waters.

Under these laws, the Department has the power to adopt rules and issue orders to protect, maintain and improve water quality.

ONTARIO

Control and abatement of industrial water pollution in Ontario is effected by implementation of relevant sections of the Environmental Protection Act and the Water Resources Act. The Industrial Wastes Branch of the Ontario Ministry of the Environment manages the industrial program and is responsible for obtaining and maintaining compliance with the water quality objectives of the Ministry.

In general, the program includes the assessment of the nature and magnitude of industrial pollution, the development of abatement and control schedules, the appraisal and approval of treatment and disposal facilities, surveillance and effluent monitoring. Industries are encouraged to evaluate their facilities and monitor their effluents. A voluntary system of reporting on effluent quality has been in operation for some time and this is being extended.

The Industrial Wastes Branch has four sections, namely, Administration, Field Services, Design Approvals and Special Projects. For administrative purposes the Province is divided into six regions, each of which borders on the Great Lakes.

Surveillance is carried out by the Field Services Section of the Branch which is organized on a regional basis within the six administrative regions. Surveillance may involve routine inspection of industrial discharges, including sampling, or it may involve intensive in-plant and effluent surveys to quantify industrial waste loadings and sources. This provides a basis for waste abatement and treatment programs for the industry. At the same time, industries are encouraged to carry out their own investigations and monitoring and to submit the results of these investigations to the Ministry.

When an industry makes application for approval of the installation of a treatment works the Design Approvals Section formally reviews the engineering details of the proposal and, if acceptable, issues a certificate of approval. The maintenance of minimum standards of operation of the facilities are a condition of the issuance of a certificate of approval and the facilities are regularly inspected by the Field Services Section.

Special Projects Section acts in an advisory capacity to the other branch sections, industry and other government bodies. The Section coordinates the industrial pollution control program of the Branch with respect to major industrial groupings such as the pulp and paper industry, the mining industry and the chemical industry.

The Water Resources Act contains a strong prohibition of any form of water pollution and prosecutions under this section are utilized to gain cooperation or punish negligence on the part of industry. Also, under this Act, the Ministry of the Environment may order companies to investigate and adopt abatement measures. Companies failing to comply with a ministerial order are subject to severe penalties for each day in default.

It is mandatory under the Ontario Water Resources Act that spills be reported to the Ministry. Spill reports and complaints are received by the Ontario Operations Centre, which is manned by staff of the Industrial Wastes Branch. The Ontario Operations Centre performs essentially a communications function, by which information of spills etc., is referred to the appropriate Ministry personnel and others for action in minimizing the consequences of accidents.

Other aspects of the industrial pollution control program include the provision of assistance to municipalities in the regulation of industrial discharges to municipal sewers. This may involve full scale industrial waste surveys of municipalities. Municipalities are encouraged to enact and enforce sewer-use by-laws to regulate industrial discharges.

In general, the guidelines that are given to industry to control waste discharges are based on identified water quality conditions in the receiving stream and available treatment technology. While emphasis is placed on the control of those parameters which have demonstrated effects on the receiving stream, industries are encouraged to remove as many waste constituents as possible from their discharges. At the same time, water conservation is emphasized from the standpoint of waste control. For example, in the chemical industry significant reductions in inorganic and organic waste loadings have been achieved by reductions in waste flow brought about by water conservation measures.

Water and materials conservation has played a significant role in pollution abatement in the pulp and paper industry. Wastewater recycle in the mining industry is being encouraged and adopted by the industry as a means of reducing waste loadings and volume of waste to be treated.

One of the problem areas in the industrial pollution control program is the pulp and paper industry.

Progress has been made with the problem of suspended solids discharges and most mills now have some form of primary treatment facility installed and operating or under construction. Levels of suspended solids discharges are generally below 100 ppm or expected to be when waste treatment facilities are operational.

Treatment and disposal of spent pulping liquors from sulphite operations remains a very large problem. The sulphite mills are all relatively small being associated with newsprint or fine paper operations and, with the possible exception of that of the Great Lakes Paper Company Ltd., probably could not stand the economic burden of sulphite recovery systems. Some research into the biological oxidation of waste sulphite liquors is presently in progress and results are encouraging.

The kraft pulping mills have displayed a reluctance to install facultative aerated lagoons as a solution to the problems of BOD_5, taste and odour, fish flesh tainting and toxicity associated with their discharges. Non-availability of land, concern over operation in cold climates, concern over nutrient discharges and uncertainty of the ability of these systems to meet the Canadian Federal Regulation for toxicity are cited as the reasons for this reluctance. Studies have been conducted into alternative methods to eliminate taste and odour and fish tainting and many mills are now showing an active interest in condensate stripping systems. However, bleach plant effluents will require treatment also and this poses a problem as biological treatment appears to be the only viable form of treatment available.

A condensate stripping system will be installed at the Domtar, Cornwall mill during 1973 and the Domtar, Trenton mill expects to install a full-scale biological oxidation system to treat its spent neutral sulphite pulping liquors before the summer of 1973.

To combat excessive aesthetic problems such as colour and foam, mills are being encouraged to install submerged diffuser outfalls. However, these are not being approved in lieu of treatment but rather as supplements to full treatment.

Lake Superior

The major Ontario sources of industrial wastewater discharged to Lake Superior are the pulp and paper, food processing, chloralkali and mining industries. Included in these are industries located on the Kaministikwia River within the municipal boundaries of the City of Thunder Bay.

Pulp and Paper Industry

Within the Ontario portion of the basin, the pulp and paper industry is comprised of seven mills. Four of the mills are located in the City of Thunder Bay, with the others located at Red Rock, Terrace Bay and Marathon. The seven mills produce a total of about 4300 tons per day of pulp. About 3000 tons per day are used to produce newsprint, container-board and fine paper, with the remaining 1300 tons per day of pulp produced for further processing elsewhere. The average pulp production by process is:

Groundwood pulp	1700 tons/day
Sulphite pulp	600 tons/day
Kraft pulp	2000 tons/day

The pulping process or combination of processes used varies from mill to mill and is summarized as follows:

Pulping Process or Processes Used	Mill Locations
Kraft only	Kimberly Clark - Terrace Bay American Can - Marathon
Groundwood and Kraft	Domtar - Red Rock
Groundwood and Sulphite	3 Abitibi Mills - Thunder Bay
Groundwood, Sulphite and Kraft	Great Lakes Paper - Thunder Bay.

The present level of control required of the industry has been established in three program stages. The first stage has involved study of wastewater sources within each mill to establish waste characteristics. The mills were also requested to reduce fibre losses and water usage and eliminate or treat many of the gross discharges of suspended solids such as bark from woodroom operations. The second stage requirement is for external primary treatment of effluents to reduce suspended solids to acceptable levels. The construction of treatment facilities to implement the second stage at the seven mills discharging to Lake Superior will be completed in December when the clarifier installations at the Domtar, Red Rock mill is expected to be placed on line.

The third stage of the Ministry's water pollution control program for the industry includes, where needed, reduction of BOD_5, elimination or destruction of taste and odour producing substances, toxic wastes and elimination of remaining aesthetic problems by 1975. At present, the Ministry has commitments for major expenditures on the third stage of the program from three of the four kraft mills.

Food Processing Industry

There are two food processing plants in Thunder Bay with effluent discharges to Lake Superior and the Kaministikwia River. Canada Malting produces malt from barley grain and Industrial Grain Products produces starch and protein products from wheat flour.

The effluents from these plants are expected to be discharged to the City of Thunder Bay municipal sanitary sewerage system when the trunk sewer programs are completed. The sewer connection to the starch plant is expected to be completed in 1973. Present municipal plans provide for installation of the trunk sewer to the malting plant vicinity by 1978.

Chloralkali Industry

American Can at Marathon discharges its effluent to Lake Superior, while Dow Chemical, located at Thunder Bay, discharges its effluent to the Kaministikwia River.

Both plants produce caustic soda (sodium hydroxide) and chlorine by the electrolysis of salt (sodium chloride) solution in mercury cells. The only characteristic considered to be of environmental significance in the effluent from these plants is the mercury content.

With imposition of Ministry regulations in 1971, mercury levels discharged in the wastewaters from these plants were reduced to levels currently regarded to be acceptable.

Mining Industry

The only operative mining operation in the northern portion of the basin is the Algoma Ore Properties Ltd., at Wawa. The iron mining and sintering operations discharge an effluent of 3.3 million gallons per day to the Magpie River, some ten miles above the river mouth, comprising large quantities of iron and solids.

The company recently received Ministry approval for improved treatment facilities. These changes are expected to achieve improved suspended solids removal and pH control.

St. Mary's River

Abitibi Paper Co. Ltd., - Sault Ste. Marie
Algoma Steel Corp. Ltd., - Sault Ste. Marie

Lake Huron

The uranium mining region of Eliott Lake, drained by the Serpent River, affects the local water quality of Serpent Harbour entering the North Channel where levels of Ra_{226} approximate 3pCi/l.

Tainting of flesh in fish taken from the North Channel adjacent to the Spanish River has been linked to pulp and paper industrial waste effluents discharged upstream to the Spanish River.

The most significant industrial development on the shore of Lake Huron centres round the nuclear generating complex under development at Douglas Point. This comprises an existing experimental generating station, a heavy water extraction plant and a major nuclear generating station which is not yet operational.

In 1972 an inter-Ministry Task Force on Generating Station Siting was established to provide a review of future siting recommendations of Ontario Hydro thereby ensuring adequate consideration of all environmental aspects related to site selection and operation of generating stations in Ontario. Concerns at Douglas Point centred around the ability to control losses of hydrogen sulphide from the heavy water extraction plant, which uses the gas in an isotope exchange process, and the potential thermal pollution problem. Present indications are that hydrogen sulphide losses can be effectively controlled. Recently the Ministry approved a cooling water discharge program which is not expected to present a problem.

St. Clair-Detroit River System

Imperial Oil Enterprise - Sarnia
Polymer Corp. Ltd., - Sarnia
Dow Chemical of Canada Ltd., - Sarnia
Ethyl Corp. of Canada Ltd., - Township of Moore
Ontario Hydro: Lambton Generating Station - Township of Sombra
Libby, McNeill and Libby of Canada Ltd., - Wallaceburg
East Side Plating (Canada) Ltd., - Windsor
BASF Wyandotte Corp., - Fighting Island
Allied Chemical (Canada) Ltd., - Amherstburg

Lake Erie

Omstead Fisheries 1961 Ltd., - Wheatley
Electric Reduction Co. of Canada Ltd., - Port Maitland

Lake Ontario

Dominion Foundries and Steel Ltd., - Hamilton
Domtar Chemicals Ltd., - Hamilton
Steel Co. of Canada Ltd., - Hamilton
St. Lawrence Starch Co. Ltd., - Port Credit.

St. Lawrence River

Fotherill Chemicals Industries Ltd., - Township of Augusta
DuPont of Canada Ltd., - Township of Augusta
Domtar Fine Papers Ltd., - Cornwall.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 2 - MERCURY AND OTHER TOXIC HEAVY METALS

CANADA

National Regulations covering the mercury discharged by chlor-alkali plants (in their liquid effluents) are presently in force. Every chlor-alkali plant discharging into Lakes Erie and Ontario is in compliance with the Regulations and under continuous surveillance.

UNITED STATES

National policies are established to: prohibit the discharge of toxic pollutants in toxic amounts, provide Federal assistance for construction of waste treatment works, develop and implement area-wide waste treatment plans, and undertake a major research and demonstration effort to eliminate the discharge of pollutants.

The basic mechanism for carrying out the goals and policies of the law is effluent limitations of various sorts. The law sets effluent limitations for all sources of discharges into the navigable waters.

Point sources other than publicly owned treatment works must use the best practicable control technology currently available not later than July 1, 1977, and publicly owned treatment works in existence on July 1, 1977, or approved prior to June 30, 1974, must meet limitations based on secondary treatment. Not later than July 1, 1983, all treatment works must be in compliance with requirements that alternative waste management techniques have been evaluated and that the proposed works have provided for the application of the best practicable waste treatment technology over the life of the works. Point sources other than publicly owned treatment works use the best available technology economically achievable for each category or class of source not later than July 1, 1983. Also by this date, effluent limitations will contain a requirement for no discharge of pollutants from categories or classes of discharger for which the Administrator finds the requirements technologically and economically achievable.

Not later than July 1, 1977, all dischargers are required to meet any more stringent limitations existing at that time, including those necessary to meet any water quality standards, treatment standards, or compliance schedules, which have subsequently been under any other State or Federal law or regulation, or have been required to implement any applicable water quality standard.

Pursuant to the new Act, the Administrator has one year in which to establish regulations defining the degree of effluent reduction attainable by the best practicable control technology. He has 60 days to provide information on the degree of effluent reduction attainable through the application of secondary treatment. Once issued, a Permit will contain in a single document the complete schedule of construction, effluent limits, and monitoring and reporting requirements.

A list of major industrial dischargers has been developed for the Great Lakes. These will be given high priority for processing towards issuance of permits. Municipal dischargers will be required to file for a permit by April 18, 1973. On the basis of information obtained from the municipal permit application, as well as other information, a similar list of major municipal dischargers will be developed.

Each chlor-alkali plant within the United States portions of the Niagara River and Lake Ontario basins, which are under Federal Court Stipulation to reduce its net discharge of mercury, has complied with the action. Those plants not under Court Stipulation have also reduced their discharges to the lowest practicable levels and are continuing efforts to further minimize mercury losses. However, warnings against the consumption of certain species of fish caught in the St. Lawrence River remain in effect. A need exists for additional surveillance work on that river to isolate sources of mercury and other toxic heavy metals which appear to be unusually high for this relatively unpopulated area.

INDIANA

A staff survey and periodic water quality surveys of the industries in the Lake Michigan drainage basin indicate that mercury use in the area is insignificant. In cooperation with the Environmental Protection Agency in sampling and monitoring programs it was determined that the mercury concentration in the Lake water is below the SPC 4R standard of .005 mg/l.

Starting January 1973, samples for metals will be collected from an increased number of permanent stream and Lake Michigan sampling stations on a routine basis. Municipal sewage treatment plants in the basin will be sampled at intervals determined on the basis of two sets of grab samples. Various industries in the basin will be required to do their own monitoring.

MICHIGAN

The Michigan Water Resources Commission monitors for heavy metals in surface waters on a regular basis in its Great Lakes tributaries, interstate and intrastate rivers, and interstate and intrastate municipal water intakes. The mercury crisis of 1970 prompted the additional screening of lake and stream locations throughout the state for accumulations of mercury in sediments, sampling of municipal wastewater treatment plant effluents, industrial effluent sampling, and testing of drinking water supplies in the affected area of southeastern Michigan.

Two significant discharges of mercury compounds were located within Michigan.

Wyandotte Chemical on the Detroit River was forced to shut down its mercury cell chlor-alkali operations. General Electric, inland near Edmore, halted their mercury cell process until they had developed a recycling control program eliminating the possibility of further mercury losses.

In an effort to define the risks of eating mercury contaminated fish the Michigan Department of Public Health is presently conducting a study of the people in the Lake St. Clair area. They are correlating personal histories and analyses of blood and hair specimens from individuals who do and do not eat these fish to see if mercurial buildups are occurring.

An offshoot of the mercury crisis was the investigation of environmental levels and potential hazards of other heavy metals throughout the state. The data from this investigation is now available in the Michigan Water Resources Commission report "Heavy Metals in Surface Waters, Sediments, and Fish in Michigan", July 1972.

The Water Resources Commission currently establishes effluent restrictions for heavy metals for individual industrial or municipal discharges rather than a single set of standards for all dishcarges. The restrictions are based upon individual safe concentrations for fish and other aquatic life as established by available bioassay data. Combined effects of more than one metal in an individual discharge are also considered.

MINNESOTA

Currently, the Agency does not have an ongoing separate program for control of mercury and other toxic metals. The plan review process for new facilities as implemented by the Section of Industrial and Other Wastes includes analysis and standards for the control of such wastes as they may occur in each instance.

Separate programs were conducted on mercury sources including all suspected users. Most industrial sources had discontinued usage and a program for replacing mercury seals in trickling filters has been instituted.

NEW YORK

The State has a policy of substantial elimination of the discharge into any of the international waters of mercury or other toxic metals. A vigorous program of abatement of mercury pollution has resulted in the decrease in concentrations at involved facilities down to the lowest level possible.

OHIO

Subsequent to the "Mercury Alert" in April 1970 the Ohio Water Pollution Control Agency instituted the following program:

1. Statewide surveys often in cooperation with the Federal EPA to determine sources of mercury pollution. Industrial and municipal discharges, streams, sediments and water supplies were studied. The study dealt with not only those entities under permit to the State, but also to those discharging directly to municipal sewage systems.
2. In the relatively few instances where possible significant discharges of mercury were encountered, corrective measures were taken to greatly abate or eliminate the discharges. These measures included elimination of all discharges, abandonment of processes involving mercury, etc.

The program has been effective. As examples:

A mercury-cell chlor-alkali plant which had been discharging mercury at levels in the pound range per day now typically has an effluent with concentration of 2 to 3 parts per billion and a total loading, as it leaves the plant site, of only about 15 grams per day. A mercury catalyst manufacturer formerly discharging significant quantities of mercury to a municipality which in turn bypassed directly to the river discontinued the process completely. Mercury from this source is now virtually zero. Companies engaged in the manufacturing of lamps, electrical equipment, etc., which formerly discharged small quantities of mercury, have bottled up their operations completely. A study of paper mills indicated that of the thirty or so in Ohio only one was using mercury compounds, in this case, as a pigment not as a biocide. This use was stopped.

The impact of whatever mercury has been discharged on water supplies has by regular surveillance been determined to be negligible. In all cases mercury levels were found to be well below the 5 ppm Federal guidelines limit for the edible portion of fish.

Other toxic metals are handled by the industrial wastes permit program with treatment being required to produce an effluent which will not contravene established water quality standards. Industries are required to submit monthly operating reports.

PENNSYLVANIA

Major sources are Parker White Metal Co., General Electric Co. and Electric Materials Co. Oxidation of cyanides, reduction of hexavalent chromium, and the alkaline (hydroxide) precipitation of heavy metals is required. Performance is satisfactory.

WISCONSIN

Fish from a variety of Wisconsin waters have been analyzed for mercury, lead, arsenic, zinc and chromium since May 1970. In addition, surface waters, bottom sediments, public water supplies and sewage treatment plant effluents and sludges have been sampled and analyses for a series of heavy metals conducted.

Notable Exceptions

Lake Michigan - Paper mills along the Lower Fox River have in the past contributed to the mercury content of the bottom sediments in this stretch of the river. Mercury slimicides have not been used by these mills since May 1970.

ONTARIO

Chlor-alkali plants and pulp and paper mills have been identified as the principal industrial sources of direct discharges of mercury to the aquatic environment. Since 1969, levels of mercury in wastewaters from these plants have been regulated by direct order of the Ontario Ministry of the Environment to minimum practicable losses.

In the case of the chlor-alkali plants, this has involved wastewater segregation, mercury recovery and recycle, brine collection and recovery systems and chemical waste treatment.

Total daily losses of mercury in liquid effluents from the six chlor-alkali plants in Ontario averaged 1.33 lbs./day during 1972. This is likely to decrease to 0.6 lbs./day as the Dow Chemical of Canada, Ltd. (Sarnia) converts from cells using mercury to the diaphragm cell process (no mercury) and as the Canadian Industries Limited plant (Hamilton) ceases operations in 1973.

Losses of mercury via hydrogen vented to the atmosphere, via cell room vents, via the disposal of solid wastes, and via the sale or use of caustic containing traces of mercury continue to be experienced at all plants. Atmospheric discharges of mercury from the chlor-alkali plants meet provincial air quality standards and monitoring of air in the vicinity of these plants indicates that most of the mercury is deposited in the immediate vicinity of the plant.

Solid waste handling practices vary from plant to plant. All plants dispose of mercury contaminated solids in accordance with the requirements of the Solids Waste Management Branch of the Ministry. Generally, solid wastes are impounded in impermeable disposal sites. This may involve plastic or clay lined basins. One plant mixes solids with concrete before disposal and another plant recovers mercury from the solids by hypochlorite extraction before disposal.

All plants filter caustic for the removal of mercury. The filtered caustic may contain up to 0.5 ppm. The total quantity of mercury present in caustic produced by all of the Ontario chlor-alkali plants during December 1972 was 120 lbs. With completion of the conversion of the Dow Chemical plant this quantity is expected to be reduced to 20 lbs. per month.

Losses of mercury from pulp and paper mills were eliminated by the use of alternatives to phenyl mercuric acetate as a slime control chemical.

Other secondary industrial sources of mercury which have been investigated include battery manufacturing, latex paint preservatives, laboratory instruments, dental amalgams and mining effluents. With the exception of battery manufacturing, no significant water-borne losses of mercury resulted from these sources. The battery manufacturing waste problem was dealt with by in-plant controls and an adsorption filter.

Programs for the control of other toxic metals centre upon the routine surveillance of mining, metal working and metal finishing effluents. Considerable quantities of toxic metals are collected in municipal sewage systems. Programs to encourage and assist municipalities in the passage and enforcement of municipal sewer-use by-laws have been implemented to deal with this situation. These programs include the development of a model sewer-use by-law, the provision of advice and assistance to municipal officials in the passage of such by-laws and the carrying out of municipal industrial waste surveys to define industrial waste loadings, including metals, in a municipality. During the past three years a course on industrial waste control and by-law enforcement has been offered to municipal officials. In the research area, investigations into the effects of trivalent chromium on sewage treatment processes have been conducted by the Research Branch of the Ministry of the Environment to assist municipalities in the regulation of this metal.

Other areas of concern are the metals associated with waste discharges from base metal mining operations. These discharges do not constitute a direct input to the Great Lakes but may be significant tributary inputs. The base metal mining operations in Ontario are usually based on the extraction of metal values from sulphidic ores. Consequently, acid mine drainage plays a significant role in the leaching of toxic metals from mine tailings. This has been investigated and procedures recommended to the mining companies to alleviate this problem. Notable successes have been achieved in this area by proper waste control, wastewater segregation, wastewater recycle and lime precipitation.

Guidelines for wastewater control in the mining industry in Ontario have recently been promulgated. These define desirable levels of metals and other waste parameters in mining effleunts and receiving streams.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 3 - TOXIC PERSISTANT ORGANIC CHEMICALS

CANADA

Surveys of PCB's in the waters and biota of Lakes Erie and Ontario were conducted in 1970 - 72. Studies at CCIW are continuing and will be expanded to include phthalates. Recent Legislation concerning pesticides is described in Section IV. D. 1. Additional Legislation is under development to control a broad range of environmental contaminants including the persistant organic chemicals.

UNITED STATES

See Section IV. B. 2.

ILLINOIS

Water samples have been collected from two minor tributary creeks and the effluent from the two major North Shore Sanitary District wastewater treatment facilities and analyzed for lindane, aldrin, endrin, heptachlor and DBP. None were present at detectable levels.

The samples were analyzed for biphenyls and DOP, in addition samples were analyzed for methoxychlor, dieldrin and heptachlor epoxide.

Sediment samples were analyzed for aldrin, endrin, DDT, phthalates, lindane, heptachlor, DOP, and DBP.

Fish samples were analyzed for DDT, DDD, dieldrin, heptachlor epoxide, methoxychlor and lindane. In addition samples were analyzed for polychlorinated biphenyls and phthalates.

INDIANA

In April 1971, a questionnaire was sent to 21 industries which were thought to be contributors of PCB to Lake Michigan. The results of the survey indicated that the usage is as follows:

Arochlor 1,248 - 2,400 pounds/year
Pydraul 135 - 5,000 gallons/year
Pydraul 150 - 1,100 pounds/year

It should be noted that these materials are utilized in systems that have no discharge to waters tributary to Lake Michigan.

Samples for PCB's and phthalates will be collected from permanent tributary and Lake Michigan sampling stations on a routine basis. Municipal sewage treatment plant in the basin will be sampled at intervals determined on the basis of two sets of grab samples. Various industries in the basin will be required to do their own monitoring.

MICHIGAN

Michigan Water Resources Commission has monitoring programs directed towards pesticides, polychlorinated biphenyls (PCB's), phthalates and other organic chemicals.

The initial 1968 pesticide monitoring program was a localized study of a south-western Michigan area where 4,255 acres had been treated with chlordane and dieldrin for Japanese beetle control. This monitoring program included studies of effects on aquatic organisms, biological uptake and magnification in caged freshwater mussels and concentrations of chlordane and dieldrin in water and sediments. Estimates were made of the total poundage lost to Lake Michigan via streams draining the application area. The data is available in the Michigan Bureau of Water Management report "Stream Insecticide Monitoring Studies, Berrien County, Michigan, October 1968 through July, 1970". Concurrent studies on soil concentrations of chlordane and dieldrin in the application area and blood levels in the applicators were conducted by the Michigan Departments of Agriculture and Public Health.

A Michigan statewide pesticide monitoring program was instituted in 1969 as a result of an Environmental Protection Agency grant to upper Great Lakes states. The 1970-71 program consisted of quarterly samples of water and settleable solids from major tributaries, measurement of biological pesticide uptake by freshwater mussels in smaller tributaries, and analysis of water samples from Great Lakes municipal water intakes. After grant terminations the tributary and water intake sampling has been continued on an annual basis.

Results of the monitoring in the Lake Michigan basin during the grant period are available in a composite report which incorporates each of the states' contributions. The report is entitled "An Evaluation of DDT and Dieldrin in Lake Michigan", Environmental Protection Agency Ecological Research Series, Report No. EPA-R3-72-003, August 1972.

Regulatory action has been taken to control the sale of pesticides. DDT registration was cancelled in June 1969 A list of "restricted use" pesticides was developed and sales of these must be reported by dealers. Dealer licensing and written exams for commercial pesticide applicators are now requirements.

In 1971, a monitoring program for polychlorinated biphenyls was initiated. To determine existing levels and sources, samples were taken in tributary waters, stream sediments, water intakes, groundwater, sanitary landfill runoff, municipal wastewater treatment plants and industrial discharges. Intensive survey efforts were undertaken in streams and municipal wastewater systems displaying significant concentrations. PCB users identified by monitoring programs or questionnaire replies have been encouraged to convert to non-PCB compounds as rapidly as possible.

After finding that PCB concentrations in catfish from Saginaw Bay of Lake Huron exceeded the FDA tolerance limit of 5 ppm the Michigan Department of Agriculture has restricted commercial fishing to catfish not exceeding 18 inches in total length. Health warnings have been issued by the Michigan Department of Public Health to sport fishermen concerning Salmonid species from Lake Michigan.

During the 1971 analytical surveys for pesticides and PCB's the presence of phthalate compounds was consistently noted in water and fish samples. These organic compounds are being widely used with particular application as plasticizers in polyvinyl chloride plastics. Concentrations in natural waters, discharges from wastewater treatment plants and individual sources are being determined.

Industrial surveillance reports required by Michigan's Act 200 has provided the state with approximate annual use figures.

More research on the biological effects of these compounds is needed before the significance of the monitoring surveys is determined.

Investigations of other toxic organic chemicals include surveys to determine the extent of contamination of surface waters with hexachlorobenzene (HCB) hexachlorobutadiene (HCBD). These compounds are both by-products of processes which involve the chlorination of hydrocarbons. In addition, HCB has been widely used in some agricultural areas as a fungicide on grains and other crops.

Michigan has recently developed a cooperative state-federal study of contaminant levels in Great Lakes fish species including lake trout, salmon, whitefish, chubs, menominee, yellow perch, alewife, carp and suckers. Fish from Lakes Michigan, Huron, Erie and Superior will be systematically sampled to obtain information on areas where contaminants approach or exceed FDA guidelines for food protection. The project, developed by the State agencies in cooperation with the Federal Food and Drug Administration and the Bureau of Sport Fisheries and Wildlife Great Lakes Laboratory will initially establish patterns of residues of mercury, PCB's, DDT, and dieldrin in Great Lakes fish. Screening will also be done for the presence of any other contaminants at abnormal levels.

MINNESOTA

The Agency does not have a separate program for dealing with toxic and persistent organic chemicals. WPC 14, 15, and 23 include standards for such chemicals found in intrastate and interstate waters, and effluents. Routine laboratory analysis of samples taken in field investigations and the water quality monitoring program include such analyses. Preliminary discussion phases with applicants for permits and the plan review process for proposed facilities as conducted by the Section of Industrial and Other Wastes include consideration of all expected effluent characteristics including toxic and persistent chemicals that may occur in industrial wastes. Permits and effluent conditions are then prepared incorporating necessary limitations for all parameters.

NEW YORK

A similar policy as described in IV.B.2. for complete elimination applies to toxic persistent organic contaminants.

OHIO

The Ohio EPA in cooperation with the U.S. Geological Survey has ten monitoring stations for pesticides in Ohio. Three of the stations are located in the Lake Erie Basin: at Waterville on the Maumee River, at Fremont on the Sandusky River and near Kent on the Cuyahoga River. Bimonthly composite samples are collected between April and November. Samples are analyzed by gas chromatograph for fourteen pesticide residues. Data from this program is input into the Federal STORET system for storage or statistical analysis.

There are several research projects either recently completed or in their final stages concerning pesticides in the Lake Erie Basin. Research on the "Movement of Pesticides from Cropland into Lake Erie" is being conducted by Ohio State University. Analysis and evaluation of water, sediment and mollusk samples collected from the Maumee, Huron, Portage, Grand and Sandusky Rivers is currently in progress with a final project report expected within six months. Ohio State University personnel have recently completed a study on "Agricultural Chemicals and Sediments Emptying into Lake Erie". Copies of the final project report are available through the Water Resources Center, Ohio State University. Lastly, the Federal EPA has an ongoing "National Soils Monitoring" project. Several sampling stations are located in Ohio's Lake Erie Basin. Samples are analyzed for both chemical and pesticide residues.

Regulatory control of pesticide usage and application procedures in the State is maintained by the Ohio Department of Agriculture. Herbicides and pesticides must be approved and registered for use under the State's "Economic Poisons Act" and "Herbicide Law". In addition, the "Ohio Pesticide Use and Applicator Law" requires the licensing of pesticide applicator firms as well as certification of pesticide equipment operators.

PENNSYLVANIA

Lake Erie has been monitored for toxic persistent chemicals and the sampling shows these substances are not present in the detectable range.

WISCONSIN

Wisconsin has conducted surface water, wastewater, and biological specimen monitoring programs in the waters of Lake Michigan since 1968. These programs have been primarily aimed at persistent and cumulative chlorinated hydrocarbon pesticides.

Recently, the Department of Natural Resources has conducted evaluations for phthalates and PCB's at selected wastewater sites. The current program calls for an evaluation of all municipal wastewater sources and selected industrial wastewater sources for PCB's, chlorinated hydrocarbons, phthalates, and other compounds that are hexane extractable, GC separated and detected by electron capture methods. The acquisition of a Mass Spectrophotometer for identification purposes will be helpful.

ONTARIO

The regulation of industrial sources of persistent toxic organic chemicals is dependent upon the identification of such chemicals and the subsequent determination of industrial sources of these chemicals. It therefore falls upon the Laboratories and Research Branches of the Ministry to identify such chemicals or for such chemicals to be brought to the attention of the Ministry by other agencies and institutions.

In 1969 polychlorinated biphenyls (PCB's) were identified as potentially significant environmental contaminants which were persistent, toxic and of industrial origin. In cooperation with Monsanto Chemical Company, the sole North American producer of these compounds, the major industrial users of PCB's were identified and investigated during 1969 and 1970. The usage of PCB's by these industries was quantified and handling procedures inspected. Subsequently, the sale of PCB's for so-called open-ended applications, principally in sealants, caulkings and coatings and as hydraulic and heat transfer fluids was terminated by Monsanto. This has been confirmed by contact with the major users of PCB's in such applications.

The only industrial application that remains is as an insulating oil in transformers and capacitors for use in enclosed areas where a fire hazard may exist. The handling procedures of PCB's in the manufacture of such transformers has been inspected and found satisfactory from the standpoint of control of losses.

Facilities are available in the United States for the disposal by incineration of waste transformer oil containing PCB's and similar facilities are being developed in Ontario.

At the present time emphasis is being placed on the monitoring of PCB's in the aquatic environment and the assessment of low level losses from industries and municipal sewage systems.

Other areas of investigation into persistent toxic organic compounds include investigation of the significance of industrial sources of hexachlorobenzene (HCB). This is an agricultural chemical which has had limited application as a seed treatment in Ontario. It has been identified as a potential hazard to human health as a result of poisoning which occurred in Europe from the consumption of contaminated grain products. HCB may also occur as a contaminant in industrial effluents, principally from the manufacture of perchloroethylene and from diaphragm cell chloralkali plants. Initial awareness of this compound was provided by Dow Chemical of Canada Ltd., who provided the Ministry with the results of their investigations into sources and analytical procedures for HCB. This company has taken steps to eliminate discharges of HCB from their Sarnia complex and no other significant industrial sources of this compound have been identified in Ontario.

Considerations of toxicity and degradability as well as other long term considerations are taken into account in the assessment of all organic chemical industrial discharges. These considerations have provided some of the incentives to place requirements upon the industry to maximize in-plant controls of organic materials regardless of their short-term impact on receiving waters.

Furthermore, in the pulp and paper industry, concern for the toxicity of organic and inorganic waste constituents will probably dictate future programs of waste control and treatment in this industry.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 4 - THERMAL DISCHARGES

UNITED STATES

Thermal discharges, as other discharges, will be handled in accordance with the NPDES Permit Program established by the Federal Water Pollution Control Act Amendments of 1972. Inasmuch as the best practicable control technology has not yet been established, the following procedure will be followed in handling permits:

a. Each permit application will initially be processed on the basis of compliance with Federally approved water quality standards. Under the statute, if it is determined that the best practicable control technology for thermal discharges requires more than the achievement of water quality standards such as off stream cooling, the discharger will be required to install such facilities unless the discharger can demonstrate that a less stringent effluent limitation will ensure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife.

b. During the term of the permit, a comprehensive monitoring program will be undertaken to evaluate the effects of the thermal discharges upon the environment.

c. The permit will be issued for a relatively short period (not to exceed three years). However, the permit shall be terminated whenever either of the following occurs: (1) a finding that the effluent being discharged does not ensure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife, or (2) the promulgation of final effluent limitations defining best practicable control technology for thermal discharges.

ILLINOIS

Illinois Water Pollution Regulations establish monthly maximum temperature standards for Lake Michigan in addition to a maximum temperature rise at any time above natural temperatures not to exceed 3°F. These regulations establish a mixing zone and discuss the location of the intake and discharge structures in broad terms in an attempt to identify the possible effects on aquatic organisms. Existing heat sources are required to demonstrate within five years that discharge from their source has not caused and cannot be reasonably expected in the future to cause significant ecological damage to the Lake Michigan.

INDIANA

The Board as a result of the Federal Conference recommendation revised its Lake Michigan thermal criteria. Stream Pollution Control Regulation SPC 4R specifies that the water temperature at a point 1,000 feet from a discharge shall not exceed the ambient temperature by more than 3°F. All new waste heat discharges or enlargements of existing facilities exceeding a daily rate of .5 billion BTU/hour which had not begun operation as of February 11, 1972, shall be limited to that amount essential for blowdown in the operation of a closed cycle cooling facility. Specific temperature values for the various months are given for Lake Michigan waters.

Northern Indiana Public Service Company is constructing a natural draft cooling tower at its Michigan City plant and has obtained preliminary approval from the Board for a similar tower at its proposed Bailly nuclear plant. Commonwealth Edison Company, Hammond is planning a dispersion outfall structure at its State Line Generating plant to alter its thermal plume so the criteria are not violated.

MICHIGAN

Michigan controls thermal effluents through issuance of an Order of Determination which gives the maximum monthly temperature and difference (Δt) above natural water temperature which must be met at the edge of the mixing zone. Maximum temperatures and Δt are specified for each of the Great Lakes and connecting waters by the state's inter- and intrastate temperature standards adopted August 1971, by the Michigan Water Resources Commission. Compliance with these standards is being determined using airborne remote sensing techniques.

Currently four Michigan utilities are conducting large-scale environmental monitoring programs under MWRC Orders of Determination to ascertain biological effects of their thermal effluents. Design and methods employed in the program are subject to approval by the WRC Chief Engineer. Michigan is also conducting caged-fish bioassay studies on the residual chlorine contained in thermal power plant effluents. This work supported by EPA funding is being carried out to establish discharge limits for present and future industrial chlorine dischargers.

Michigan has also initiated a study to determine the magnitude of the loss of fish and other aquatic organisms through entrainment in power plant intake water. The first phase of the project; gathering engineering and flow data for each facility, is nearing completion.

MINNESOTA

The Agency is in the process of adopting thermal effluent standards. Currently the staff evaluates new projects on the basis of best practicable treatment. The Section of Industrial and Other Wastes reviews proposed treatment systems. The Section of Standards and Surveys reviews the impact in the receiving waters and this would normally include temperature effects on biota.

NEW YORK

New York State has adopted "Criteria Governing Thermal Discharges". With reference to the lakes these state "The water temperature at the surface of a lake shall not be raised more than 3°F over the temperature that existed before the addition of heat of artificial origin, except that within a radius of 300 feet or equivalent area from the point of discharge, this temperature may be exceeded. In lakes subject to stratification, the thermal discharges shall be confined to the epilimnetic area".

For the rivers these are "The water temperature at the surface of a stream shall not be raised to more than 90°F at any point. Further, at least 50% of the cross sectional area and/or volume of the flow of the stream including a minimum of one third of the surface as measured from shore to shore shall not be raised to more than 5°F over the temperature that existed before the addition of heat of artificial origin or to a maximum of 86°F, whichever is less except during periods of the year when stream temperatures are below 39°F. A greater than 5°F increase may be authorized under 'Additional limitations or modifications', section 704.2 infra. For the protection of the aquatic biota from severe temperature changes, routine shutdown of an entire thermal discharge at any site should not be scheduled during the period from December through March".

The maximum values indicated above are just that and are the maximum permitted in the absence of aquatic organisms that would be damaged by these temperatures. If there are normally present aquatic organisms that cannot stand these temperatures, then the maximum temperature at that particular locale is set to accommodate them.

OHIO

Thermal discharges are being handled as an industrial waste. Where a detriment to water quality is determined to exist corrective measures are required by permit conditions or orders. All new electrical generation installations are required to install cooling facilities.

PENNSYLVANIA

The only major thermal discharge is that of the Pennsylvania Electric Company. This is located at the foot of State Street in the midst of the public docks. The discharge is confined and recirculates to a certain extent, creating excessively elevated temperatures. This ia a problem.

WISCONSIN

Thermal pollution is not considered to be a serious problem in Wisconsin at the present time. Where problems have occurred, investigations have been made and the problems remedied. State laws and administrative rules provide controls over heated water dishcarges.

Water quality standards for water temperatures have been established for all Wisconsin waters. They require that "streams classified by law as trout waters shall not be altered from natural background by effluents that affect the stream environment to such an extent that trout populations are adversely affected in any manner". When maintenance of fish reproduction is of primary importance in the public interest and natural conditions permit, the water temperature shall not exceed 84°F. The water temperature shall not be more than 5°F higher than the natural unpolluted background water temperature at any time, and the rate of temperature change shall not exceed 2°F per hour. Where fishing is desirable in conjunction with other uses and natural conditions permit, the temperature shall not exceed 89°F for warm water fish. In addition, there shall not be an abrupt temperature change of greater than 5°F at any time. Authorization must be obtained for proposed installations where the discharge of a thermal pollutant may increase the natural maximum temperature of a stream by more than 3°F.

Of the plants operating in Wisconsin, seven are on Lake Michigan and two are on Lake Superior.

Seventy-six per cent of the steam electric generating capacity in the state will be on Lake Michigan when the last nuclear unit is placed in operation about 1973.

The standards required by Chapters NR 102, 103 and 104 of the Wisconsin Administrative Code are met and are being enforced.

The Natural Resources Board approved revised thermal standards for Lake Michigan on December 8, 1971. They were published in the January 1972 Register and became effective on February 1, 1972.

The new thermal standards establish monthly maximum temperature criteria and a limit of 3°F over the existing temperature of the receiving water at the edge of an established mixing zone. Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River are exempted from the monthly maximums because of the naturally occurring higher temperatures.

For existing or soon to be completed facilities that exceed a discharge of 500 million BTU per hour, it is required that the owners submit monthly reports of temperature and flow data, a detailed chemical analysis of blow-down waters, a preliminary engineering report for the installation of alternative cooling systems and the findings of a two-year study of the environmental and ecological impact of the discharges. The environmental study must be conducted in a manner approved by the Department, and it will aid in the establishment of a mixing zone.

Any new facility must be designed so as to avoid significant thermal discharge to Lake Michigan, and should existing discharges appear to threaten or cause environmental damage, the Department may order the reduction of thermal input regardless of interim measures undertaken by the source owners.

ONTARIO

The location of thermal electric generating stations on the shores of the Great Lakes takes advantage of the capacity of these lakes to accept and dissipate waste heat from the power generation process. The Ontario government takes the position that this capacity may be utilized provided that such use does not contribute to the deterioration of the quality of the aquatic environment.

The power industry is required by the Ministry of the Environment to demonstrate that heated effluents discharged into lakes and rivers do not damage the aquatic environment. The Ministry of the Environment participates in the selection of sites through membership on the Task Force on Generation Station Siting, critically assesses proposals for pre-operational environmental studies by the industry, independently monitors the pre-operational studies performed by industry and reviews the planned location and design of discharge facilities. Post-operational surveillance programs are also critically reviewed to ensure that thermal effects are adequately monitored. Periodically, temperature and other water quality parameters are measured and samples of biota taken near the point of discharge of heated effluents.

Studies to date at existing generating stations on Lake Ontario and Lake Huron have shown no serious biological or other effects attributable to thermal discharges. Pre-operational studies at the Nanticoke site on Lake Erie which have included diffusion, current and temperature measurements as well as biological and chemical assessment indicate that conclusions regarding the thermal effects on Lake Ontario and Lake Huron cannot be applied to Lake Erie. Temperatures at the Nanticoke site reach 83 to 84°F, at least ten degrees higher than those reached in Lake Ontario.

In view of the unique features of Lake Erie, Ontario Hydro has been advised by the Ministry of the Environment that cooling devices must be installed on any future thermal electric generating station on Lake Erie.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 5 - RADIOACTIVE MATERIAL

CANADA

An ad hoc committee comprising representatives from the Department of National Health and Welfare, Environment Canada, Atomic Energy Control Board, Atomic Energy of Canada Ltd., Ontario Department of Health and Ontario Ministry of the Environment, is presently developing objectives for radioactivity on the Great Lakes.

It has been generally agreed that the radioactivity objective should be based on the recommendations of the International Commission on Radiological Protection. It has also been agreed to consider the question in terms of the projected population radiation dose which might result from a given pollution level in the lakes as a whole.

UNITED STATES

EPA has the basic responsibility to protect the public from the adverse effects of ionizing and non-ionizing radiation. This authority comes from Executive Re-organization Plan No. 3 of 1970, transferring to EPA specified functions and resources from the Atomic Energy Commission, the Bureau of Radiological Health, and the Federal Radiation Council. These transferred functions provide EPA with the authority to:

1. Establish generally applicable environmental radiation standards for the protection of the general public from radioactive materials.
2. Perform research, development and surveillance, provide

assistance to States and provide training and research grants.

3. Advise the President with respect to radiation matters directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs in cooperation with the States.

EPA's responsibilities in radiation are carried out through programs of criteria development, technology assessment and surveillance.

Criteria Development

Significant research programs have been conducted for many years into the effects of very low levels of radiation over long periods, such as those encountered from routine emissions of nuclear power plants. In light of the known carcinogenic, mutagenic and teratogenic properties of ionizing radiation, emphasis must be dedicated to minimizing these discharges to the environment. Recognizing this, EPA has adopted what it considers to be a prudent, conservative policy, and bases development of radiation standards and guidelines on the following criteria.

1. All radiation is potentially harmful.
2. The biological risk associated with low levels of exposure is proportional to those risks that have been estimated at higher exposure levels.
3. Exposure to radiation should always be as low as practicable.
4. No exposure should be allowed without the expectation of some net benefit to society.

This last criterion indicates that standards for each source class of radiation; e.g., nuclear power plants, fuel reprocessing plants, mining, etc., should be treated on an individual basis.

In fulfillment of its responsibility for setting generally applicable radiation standards, the Environmental Protection Agency now has underway a major review of all existing Federal radiation protection criteria, standards, guidelines, and policies. This review is conducted in cooperation with the Department of Health, Education, and Welfare; the Department of Defense; and the Atomic Energy Commission and is scheduled for completion in 1972.

Technology Assessment

In this critical area, EPA has the responsibility for evaluating major Federal actions involving ionizing and non-ionizing radiation, and the design, construction, operation, modification, or discontinuance of applications of technology related to these radiations in order to assess the impact on the environment and population. All new Federally sponsored or regulated activities or extensions thereof are evaluated, as well as all industrial and commercial products or processes, which may have an effect on the environment and result in additional radiation exposure.

EPA also has the responsibility to determine the potential impact of nuclear applications or other uses of radiation, and the appropriate measures to control and minimize all potential adverse effects. Environmental impact statements submitted by other Federal agencies on applications of radiation-related technology are evaluated. Program guidance and technical assistance are provided to States, relative to applications of nuclear technology and other radiation uses in order to minimize the impact of such actions on the environment and the public.

The environmental impact of these nuclear reactors is a major concern of EPA. As an "advocate of the environment" EPA has a direct responsibility to protect the health of people living near these plants - and near the facilities that process their fuel and receive their radioactive wastes - against the adverse effects of the plants' radioactive emissions and discharges of waste heat.

The impact of the nuclear power program is determined by review of the impact of individual plants and by studies of various classes of nuclear facilities, such as light-water-reactor power plants, reprocessing plants, mining, etc., on the basis of both immediate and long-term environmental impact. Anticipated future developments such as the breeder reactor program are being evaluated in terms of environmental impact.

Surveillance

EPA conducts surveillance programs to obtain base line data on the levels of existing environmental radiation; determine any changes occurring in the radiological quality of the environment, the magnitude of this change, and the nature and probable source of the contaminant; provide data for estimating population exposure to ionizing and non-ionizing radiation; and determine if environmental levels are within established radiological guidelines and standards. EPA also publishes periodic environmental radiological quality data from Federal, State and utility surveillance programs.

These programs and studies are being undertaken to protect the public health and welfare from both immediate and long-range environmental impact of the nuclear energy program and from non-ionizing radiation sources.

Strategies for achieving these environmental goals have been developed and are continually assessed and reviewed as information from these programs becomes available.

Potential Radiation Sources and Related Hazards

Present and future sources of radioactive contamination in the Great Lakes area are numerous and include hospitals, industrial laboratories, nuclear reactors, and fuel fabrication and reprocessing plants. Due to the density of population bordering the Great Lakes, and the abundant supply of water required for reactor cooling, this area represents one of the most significant receptors of radionuclides resulting from nuclear power and the commercial use of radionuclides in medicine and industry.

The Great Lakes region has participated substantially in the development of the nuclear power industry. One of the first commercial nuclear power plants, the Big Rock Point Station is located on Lake Michigan and the first commercial fuel reprocessing plant is located near West Valley, New York on the Cattaraugus Creek, which flows into Lake Erie. Nuclear reactors in the Great Lakes area account for approximately 38% of all reactors operating, being constructed and ordered in the United States.

It is apparent from the current and future projections for the rapid development and concentration of nuclear power facilities in the Great Lakes area, that present studies will need to be expanded and others initiated to identify and define the primary sources of radiation contamination to the Lakes. In addition to the radioactive contaminants during normal operation, releases in the unlikely event of a major reactor accident would represent a significant radiological hazard to the health of a large number of people and is one of the major factors considered in siting and in safety reviews of nuclear power facilities. With nearly 40% of North American continents fresh water supply and 38% of United States nuclear power generation capability located in the Great Lakes Basin, intensive efforts must be made to protect these water resources from contamination. In light of the known capability of very low levels of ionizing radiation to cause cancer, birth defects and genetic abnormalities in man, emphasis must be dedicated to minimizing these discharges to the environment.

ILLINOIS

Monthly samples are collected at the twelve municipal water filtration plants using Lake Michigan as a water source. These samples are analyzed for gross alpha and beta radioactivities. Data are reported in routine water quality monitoring reports.

INDIANA

Radioactive materials are monitored as part of regular survey work and it has been determined that the beta concentrations have averaged approximately one-tenth of the 100 picocuries per liter standard. Inspections in the industries have revealed that radioactive materials are used mainly in insignificant quantities for analytical instruments.

MICHIGAN

See III. B.

MINNESOTA

Considerable controversy is centred around the U.S. Supreme Court affirmation of the decision of the Circuit Court of Appeals, i.e. that the State of Minnesota may not issue regulations on radioactive emissions to air and water which are more stringent than those of the Atomic Energy Commission. Presently, the Agency is awaiting possible Congressional legislation to alter the nature of AEC's authority.

NEW YORK

Lake Erie receives radioactive wastes from the first commercial fuels reprocessing plant. As a result of problems identified by the State's environmental monitoring program, the reprocessing plant was required to build a low level liquid waste treatment plant to minimize discharges of Cs-137 and Sr-90. Tritium, Ru-106 and I-129 are not significantly reduced and these isotopes may be a problem in the future. There are two operating reactors and one reactor under construction on Lake Ontario. These must be backfitted to meet the new USAEC discharge requirement, "as low as practicable". Construction may be started on three or four more nuclear power plants on Lake Ontario by 1975. NYSDEC has ten sampling stations on Lakes Erie and Ontario for analyses of radioactivity in water, fish, mud and aquatic vegetation.

OHIO

The established water quality criteria include a standard for radioactive material. A monitoring program is carried on to determine that adequate control is in force.

PENNSYLVANIA

No major sources are in the area. Pennsylvania emissions regulations are at least as stringent as those of the AEC and in many instances more stringent.

WISCONSIN

The Department of Natural Resources, Division of Environmental Protection, has continued a surface water radioactivity monitoring program which was inaugurated in August 1959. Monthly samples are collected at 10 surface water quality monitoring stations and 1 sewage treatment plant. In cooperation with the Section of Radiation Protection, Division of Health, these samples are checked for gross alpha and beta radioactivity. Results of analysis are summarized and published at four-year intervals with the routine surface water quality monitoring data.

Other agencies, and at least one industry, determine the radioactivity of surface waters at specific locations in or adjacent to the state. The Public Health Service (PHS) has a radioactivity monitoring station on Lake Superior near Duluth. Milwaukee has a counter to continually monitor its water supply from Lake Michigan. At least one of the paper mills with a customer in the photographic film field monitors water and air.

Natural radioactivity is present in surface waters because of solar radiation and natural radioactive minerals in the earth's crust. Some radioactive isotopes, both man-made and natural occurring, are used at medical, industrial, and research institutions. However, the quantity used for these purposes thus far in the state and limitations placed on their final disposal by licensing agreements with the Atomic Energy Commission (AEC) result in a negligible increase in surface water radioactivity. The major fluctuations found in surface water radioactivity can be attributed to fallout from the testing of nuclear devices. The mean gross radioactivity at 10 monitoring stations in Wisconsin during 1969, 1970, 1971 and 1972 was 6.43, 6.55, 7.69 and 6.03 picocuries per liter. The mean alpha radioactivity for the same stations was .04, .13, .13 and .09 Picocuries per liter. For drinking water, a gross beta count of 1,000 picocuries per liter is grounds for rejection of the supply, except where more complete analysis shows that the concentration of nuclides is not likely to cause excessive exposure.

To control radioactive contamination, the Atomic Energy Commission maintains a licensing system based on an evaluation of specific activities of radioactive substances in the surrounding area and the type of wastes to be discharged.

At each nuclear reactor, the involved power company is required by the Atomic Energy Commission to maintain a pre-operational and post-operational radiological monitoring program. Phases of the environment surveyed are air, precipitation, river or lake water, well water, soil, silt, vegetation and milk.

The state agency having the primary responsibility for environmental radiological surveys is the Section of Radiation Protection, Department of Health and Social Services. In cooperation with the Division of Environmental Protection, samples are collected of all phases of the nuclear power plant environment and analyzed by this section. Unusual samples, such as fish, algae or bottom-dwelling organisms, are also included in the program. For each of these independent surveys, the samples are generally checked for gross alpha and beta radioactivity and gamma scan. Should these be significant, then determination would be made of specific radionuclides. A pooled milk sample from area farms is routinely analyzed for Iodine-131, Barium Lanthanum-140, Cesium-137, Potassium-40, and Strontium-90. Air is sampled continuously, and all other analysis is based on intermittent samples.

Once the nuclear reactors are operating, radioactivity is intermittently released to the environment at a controlled rate well below the limits prescribed by the Atomic Energy Commission. These limits coincide with the limits put forth in Wisconsin's water quality standards. The routine monthly monitoring program of the Department of Natural Resources is an ongoing program that is being maintained.

The Section of Radiation Protection, Division of Health, conducts selected joint inspections of AEC licensees with AEC regional staff.

ONTARIO

The growing electrical power requirements in Canada and the United States will be increasingly accommodated by the construction of nuclear power generating stations. Small amounts of radioactivity which are diluted in the cooling water discharged from such plants do not represent an immediate problem, nevertheless, the potential build-up of radioactivity in the aquatic environment from a number of stations must be considered.

The Atomic Energy Control Board of Canada is responsible for regulating the operations of nuclear facilities in Canada. The Ontario Ministry of the Environment and the Ontario Ministry of Health have representatives on the Reactor Safety Advisory Committee of the Control Board. These organizations ensure that discharges of radioactivity to receiving waters are carefully controlled and kept to an acceptable level.

The power industry is responsible for monitoring environmental radioactivity. Programs for monitoring the environment which are prepared for each station are reviewed by provincial and federal agencies in terms of their value in assessing levels in the environment. The Ontario Ministry of the Environment assesses their effectiveness in measuring changes of radioactivity in water, aquatic biota and sediments. Site selection and planned environmental studies are also reviewed by the Ontario Minsitry of the Environment from this point of view.

In addition to monitoring performed by the power industry, the Ontario Ministry of Health, the Ontario Ministry of the Environment and the

Department of National Health and Welfare make independent assessments by analyzing water, biota and sediment samples taken from the vicinity of nuclear generating stations.

The Pickering Generating Station is the first operating Canadian nuclear station on the lower Great Lakes. The proximity of the station to Toronto and other centres of population justified comprehensive environmental studies and extensive monitoring of public water supplies. Water samples are taken regularly at a number of lake stations and radiological studies on the uptake of radioactivity in fish and other aquatic biota from the environs are being made. Results to date have shown that measured levels of radioactivity in the aquatic environment and biota in the area of this plant are almost indistinguishable from background.

There are no uranium mining or concentrating activities with direct liquid waste discharges to the Great Lakes or the inter-connecting waterways. Liquid wastes from the Elliott Lake activities drain via the Serpent River System to Lake Huron and wastes from the Bancroft area activities drain via the Crowe and Eels Rivers to the Trent River System.

The operating uranium mining companies, including both Dennison Mines Limited and Rio Algom Limited are carrying out good pollution control programs including tailings impoundment and chemical treatment where required. In addition, much progress has been made by these companies in providing acceptable waste treatment facilities for flows from abandoned tailings areas produced during earlier activities. Generally, treatment provided at each of these operations includes both pH control and the addition of barium chloride for radium control.

In the uranium hexafluoride plant of Eldorado Nuclear Limited, a closed system has been developed for the treatment and recycling of the process wastewater. Thus, only uncontaminated cooling water is now being discharged to the Port Hope Harbor from this plant.

IV - SECTION B - POLLUTION FROM INDUSTRIAL SOURCES

SUBSECTION 6 - MONITORING, SURVEILLANCE AND ENFORCEMENT

CANADA

See III. B.

UNITED STATES

In-plant surveys are made on major dischargers and data entered into the Industrial and Municipal Inventories, for use in enforcement and for the establishment of permit conditions. Data are submitted to EPA for its use in pollution abatement programs.

Notable Exceptions

The Industrial Source Inventory is very limited at this time and practically non-existent. However, when the General Point Source File (GPSF) program becomes operational, data can be handled in the same manner as the information from municipal sources.

In the future, a pollution abatement program will be built by EPA on industrial wastes inventories through the use of Federal license or permit applications under Section 402 of Federal Water Pollution Control Act Amendment of 1972.

Permit monitoring data can be handled in the same manner as municipal data.

A continuing program to monitor water quality in the Great Lakes is lacking.

ILLINOIS

Same as described in IV. A. 5.

INDIANA

Effluent monitoring requirements were established in March 1971, by Regulation SPC 11, which makes it mandatory for all dischargers in the State to submit monthly reports to the Board which shall include flow measurements and effluent characteristics. The determination to be monitored and the frequency of sampling are set individually for each plant. Many of the larger industries have been submitting such reports on a voluntary basis since before 1965.

Surveillance of industries is accomplished by routine inspections, grab samples which may be taken during plant inspections of waste treatment facilities, and by periodic 24-hour surveys which monitor the plants' discharges and the receiving waters.

Enforcement activities in the Great Lakes Basin have received the highest priority and action has been taken against industries in the basin that have not proceeded to meet implementation dates established.

The permit should satisfy the requirements set under the 1972 Federal Water Pollution Control Act. These two tools will combine to allow effective enforcement actions.

A notable exception to the State's enforcement program is the current case with United States Steel Corporation, Gary. An enforcement hearing was held and an order was issued in December 1970 requiring the completion of additional treatment facilities by December 31, 1972. The Corporation filed for judicial review in Lake Superior Court and the Board's order was set aside. The court decision has been appealed by the Board and the matter is pending in the Indiana Supreme Court.

MICHIGAN

In Michigan all industrial waste treatment facilities are to be under the operation and control of a State certified operator. The operators are required to file monthly reports on the quality and quantity of their effluent. These reports are compared to effluent standards by electronic data processing facilities and a monthly non-compliance report is furnished to all Commission Basin Engineers.

Basin Engineers inspect each industrial facility at least annually, with the larger and more complex facilities inspected on a more frequent basis or as needed. Detroit River industries are visited from 8 to 12 times annually. In addition, the Commission maintains an industrial waste survey staff which conducts 48 hour in-plant surveys of industries on a random basis or as requested by the Basin Engineers. A recent amendment to the Water Resources Commission Act has required the annual reporting of the use as well as the discharge of certain "critical" materials and the Commission staff now maintains a state-wide inventory of the location and/or discharge of these 62 potentially hazardous materials. The Detroit River industrial outfalls are monitored by Commission staff on a bi-weekly basis in the ice-free months and on a once to twice a month basis visually from a helicopter during the winter months.

Water pollution control enforcement procedures begin with the detection of occurring pollution. Staff contacts are made with the polluter seeking prompt attention and early corrective action. Where emergency conditions exist, immediate control is requested. If failure to comply with such a request is encountered, injunctive or other emergency court action is immediately sought by the Commission. Where staff contacts do not produce satisfactory prompt solutions and the problem can be solved through voluntary effort, the polluter may be allowed a brief period in which to correct the problem. If voluntary action following a conference does not proceed timely, the Commission issues a Notice of Determination and Hearing to the polluter and not less than four weeks nor more than eight weeks thereafter holds a hearing on the adoption of a proposed Final Order of Determination, which specifies waste restrictions and sets forth sequential performance dates concluding with the completion of construction of the necessary facilities and placing them in operation. All industrial Orders now also require periodic reporting on operation. If the proposed Order is contested, the matter is referred to a Hearing Commissioner, who hears the objections, evidence and testimony, and issues a report to the Commission including findings of fact and conclusions of law. Thereupon, the Commission reconvenes its hearing and may adopt the Order as proposed, as recommended by the Hearing Commissioner, or as otherwise modified. The recipient may, within 15 days after issue, appeal the Final Order of Determination to the Circuit Court.

Incipient (as opposed to occurring) pollution that could result from new or increased uses of the waters of the state for waste disposal is handled as follows:

The proposed waste discharger is required by law to file a statement describing in detail the proposed discharge. The Commission, after staff investigation, issues an Order of Determination, incorporating essentially the same type of restrictions and requirements as in a Final Order except that the necessary facilities are to go into operation simultaneously with the beginning of waste discharge. After the Order is issued, the recipient or any other affected person may request a hearing before the Commission and may appeal the decision of that hearing to the Courts. In lieu of Final Orders of Determination, the Commission sometimes enters Voluntary Stipulations with the waste discharger containing the same requirements as an Order. A Stipulation is enforceable through Court action the same as an Order. The Order procedures will be superseded by a similar but more comprehensive Permit program in 1973 under recent changes in State and Federal law.

On failure to comply with a Final Order of Determination, an Order of Determination, or a Stipulation, a hearing is held before the Commission to show cause why the matter should not be referred to the Attorney General for appropriate enforcement proceedings. If cause beyond the control of the polluter is shown, the Commission may grant reasonable extension of the specified performance time.

MINNESOTA

All industrial waste disposal systems are required to submit monthly operational reports. The parameters and frequency of analysis to be performed varies with the class of treatment facility.

Presently, treatment facilities are inspected at a rate of seventy five per year. Additional explanation of the enforcement procedures for industrial sources are set up in Section IV.A.6.

NEW YORK

All industrial discharges in the State are covered by the New York State Waste Outlet Registration Program. Industries are required to periodically sample and test for significant parameters and report such data to the State. This includes discharges of any sort, whether from a treatment plant or a process point. The data are examined to determine compliance or non-compliance; whenever there is a violation of water quality standards, the matter is turned over to Enforcement for proper action if receiving water standards are violated.

As part of the program, NYSDEC also performs testing of outlets and receiving waters to evaluate data sent in by industries. When differences are noted, they are discussed and further explored. When necessary, legal action is also pursued to abate any pollution and protect other water uses.

OHIO

See IV. A. 5.

PENNSYLVANIA

See IV. A. 5.

WISCONSIN

Section 471, Chapter 125, Wisconsin Laws of 1971, establishing 144.54 of the Statutes, became law on November 5, 1971. Section 144.54 directs the DNR to require by rule that all persons, except municipalities, discharging industrial wastes, toxic and hazardous substances or air contaminants in this state, report the manner used, amount used and amount discharged for each such waste, substance, or contaminant. This includes industrial wastes and toxic and hazardous substances discharged into any sewage system operated by a municipality. Section 144.54 also calls for annual monitoring fees to be paid by each person required to report.

Proposed Department rules for water monitoring aspects of the law were considered initially at public hearings held in April, May and September, 1972. The rules were adopted by the Natural Resources Board in December and became effective February 1, 1973 following publication.

ONTARIO

Surveillance of industrial sources of liquid waste discharges is carried out on a regional basis by the Field Services Section, MOE. Under the direction of the Regional Engineer, industries within the regions are visited by staff and industrial processes and waste discharges inspected and samples of liquid wastes collected for analysis. While there is no routine pattern of surveillance, attempts are made to visit each plant on a quarterly basis with more frequent visits where problem situations exist.

This surveillance identifies the sources of industrial pollution and abatement schedules are negotiated with the companies concerned and in some cases these schedules are formalized by direct order of the Minister under the terms of the Ontario Water Resources Act.

Monitoring of industrial discharges is incorporated into the surveillance program and at the same time the submission of regular monitoring data by individual industries is being encouraged and expanded. Major industry groups which routinely submit monitoring data to the Ministry include:

Pulp and Paper Industry
Oil and Petrochemicals Industry
Mining Industry
Metal Working and Metal Finishing Industry
Chemical Industry
Major Food Processors
Automotive Industry

Monitoring of receiving waters in the vicinity of industrial discharges is maintained to assess the impact on water quality, define treatment requirements and assess effectiveness of pollution abatement measures. Monitoring of selected receiving water stations is undertaken on a monthly basis on the interconnecting channels, bimonthly on the lakes (during the ice-free period) and tri-weekly on most tributary streams.

In major use areas receiving high volume industrial discharges; e.g. Thunder Bay and Hamilton Harbour, a number of interroute surveys to determine the effect of these wastes on the water quality have been completed.

IV - SECTION C - EUTROPHICATION

CANADA

Phosphorus Control

The Government of Canada acted in 1970 to implement the recommendations of the IJC Water Quality Boards by initiating a three-part program of nutrient control. The first part was the establishment of regulations controlling the amount of phosphorus in laundry detergents. The second part was a cooperative program with Ontario for the removal of phosphorus from municipal sewage at waste treatment plants. The third part was a study of the source and possible control of nutrients from land drainage.

The Canada Water Act, incorporating a clause on nutrient control, passed the Commons and Senate in the early part of 1970 and the first regulations under the nutrient control clause became effective August 1, 1970. The regulations limited the amount of phosphates in detergents, excluding dishwashing detergents, to a maximum of 20% expressed as phosphorus pentoxide (P_2O_5). Prior to the regulations most detergent powders had P_2O_5 contents from about 16% to 38%. It was estimated that this initial limitation reduced the amount of detergent phosphates entering Canadian lakes and rivers by 25% to 30%. As of January 1, 1973, revised regulations have limited the phosphorus content of laundry detergents to a maximum of 5% P_2O_5.

The first formal agreement between governments in response to the IJC recommendations on nutrient control was the Canada-Ontario Agreement of 1971. This agreement included provision of Federal loans of up to $167,000,000 to accelerate the construction of waste treatment facilities including nutrient removal. Also included were provisions for conduct of research on a matching grant basis up to a total Federal grant of $3,000,000. Thus $6,000,000 was committed by the governments for research for the purpose of reducing the cost of the abatement of municipal pollution.

The control of nutrients from land drainage is a subject of the special reference to IJC on Pollution From Land Drainage. The government of Canada is supporting this study with funding and manpower from several different departments.

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UNITED STATES

Phosphorus Removal

The great majority of significant municipal facilities, for which phosphorus removal is required to meet the Agreement objectives, are either now under construction or are expected to receive FY 73-74 construction grants.

Of the states bordering Lakes Erie and Ontario, Indiana, Michigan, and New York have legislation restricting detergent formulations. Pennsylvania and Ohio do not have such legislation, although Akron, Ohio is now enforcing a 0% phosphorus rule. Ohio has initiated a Lake Erie Strike Force, and by December 1973, every municipality which generates one million gallons or more of wastewater a day must have in operation phosphorus removal facilities in their sewage treatment plants.

Wastewater Treatment Facilities Grant Projects

252 Great Lakes Basin wastewater treatment facilities projects are expected to be funded in FY 73-74, based upon current allocations and state priority lists. These projects involve an eligibility cost of $961,617,900.

Included in the list of 252 are major facilities in Detroit and Wayne County, Cleveland, and Niagara Falls, all of which are scheduled for FY 73 funding. Each of these major improvements includes nutrient removal.

Since passage of the Federal Water Pollution Control Act Amendments in October 1972, 21 Great Lakes Basin projects were funded with FY 72 money. The total eligible project cost of these plants was $84,166,100. One of the projects was a major (eligible costs: $26,637,600) facility in Wayne County, Michigan.

All allocated construction grant funds for states bordering the Great Lakes, for the fiscal years 1966-72, have been fully obligated for needed wastewater treatment facilities.

Regulation Development to Implement 1972 Amendments to the Federal Water Pollution Control Act.

The status of regulations implementing the 1972 Amendments, and which will have a beneficial impact upon achieving the Canada-United States Water Quality Agreement objectives, can be summarized as follows:

1. Title II (Construction Grant) Regulations were published in the federal Register in early February.
2. Proposed definition of secondary treatment was published in April, 1973.
3. Proposed pre-treatment guidelines will be published in May, 1973.
4. Water Quality Planning (Section 303.3) Regulations were published in March, 1973.

Title II Regulations

Regulations applicable to "Grants for Construction of Treatment Works" were published in the federal Register in February, and obligations of FY 73 grant funds for needed wastewater treatment facilities are underway.

These regulations include provisions, such as the design/construct concept, which allow projects to be expedited.

Development work is also proceeding on means to assure that the maximum number of projects will be initiated and completed within the shortest possible time period. Under review, for example, are such means as defining "projects" to include both "operable segments", and "contractual segments". This will allow many more projects to begin than would be the case if entire facility projects were to be considered whole, inseparable entities. The 252 projects scheduled for FY 73-74 funding could be greatly expanded, in numbers, if the segmental project concept is adopted.

Secondary Treatment

A proposed definition of what constitutes secondary treatment was published in April, 1973. The definition will consider no level of BOD removal less than 85% (30 mg/l for domestic wastes) as being indicative of what can be obtained through secondary treatment. This level of treatment, which must be achieved by July 1, 1977 (1978 for new projects to be funded by mid-1974) will assure a significant reduction in the quantities of degradable wastes entering the Great Lakes Basin.

Pre-treatment Guidelines

Materials which will pass through municipal waste treatment facilities, or are otherwise incompatible with the treatment process itself, must (under the new Act) receive pre-treatment to acceptable levels at the pollution source. Proposed guidelines for pre-treatment will be published in May to be used by states enforcing the discharge permit authority specified by the Act.

Permit forms for municipal discharges are in a final development stage. These permits will, of course, provide limits for the discharge of all polluting materials, whether of a domestic or industrial origin.

Water Quality Planning (Section 303.e) Regulations

Section 303.e of the new Act establishes a basic system for water quality planning by the States which should assure that priority attention is given to those facilities needed for achieving water quality standards. Regulations to implement this section of the law have been published. The planning process will serve as a basic structure which will determine the water pollution control activities of both EPA and the States. Under this planning structure, control requirements for the Great Lakes Basin will be undertaken with dispatch.

Industrial Wastes

Discharges will be handled in accordance with DPDES Permit Program established by the Federal Water Pollution Control Act Amendments of 1972. The particular effluent level applied in any case will depend on the "best practicable" level established for that industry and the water quality standards. The best "best practicable" levels have not yet been established, but programs provide in general for either 80% basin-wide phosphorus removal or 1 mg/l effluent restrictions. In general, it is expected that the 1 mg/l P level or a stronger restriction will be applied.

ILLINOIS

Illinois Water Quality Regulations require that no effluent discharge within the Lake Michigan basin shall contain more than 1.0 mg/l phosphorus as P. The two large municipal facilities at Waukegan and North Chicago comply now with this requirement. Since the remaining five plants are scheduled to be phased out within the year, phosphorus removal facilities are not installed. Since Illinois has no significant tributary streams to the lake and all point sources are scheduled for removal and diversion to the Des Plaines River Basin by the end of 1975, the state does not anticipate significant contribution of phosphorus to Lake Michigan from Illinois sources.

INDIANA

Municipal Sewage

The removal of phosphorus from municipal sewage within the Great Lakes Basin is required by the Stream Pollution Control Board for all communities with populations greater than 2,000 by the end of 1972. Numerous methods of achieving phosphorus removal are utilized within the Great Lakes basin including the addition of chemicals such as ferric chloride, waste pickle liquor, alum and lime. In the heavily industrialized areas in the Lake Michigan basin the use of waste pickle liquor as a chemical has achieved much study and several municipalities have chosen this approach. No municipalities have proposed biological methods of phosphorus removal. Several municipalities will be using polymer injection facilities. Inorganic metal ions will be injected to the influent and/or effluent side of a biological treatment unit while lime will be applied to the influent side of a tertiary clarifier.

Industrial Wastes

The Lake Michigan Conference recommended that dischargers to the Lake and its tributaries be required to remove 80% of the phosphorus in the wastewater in excess of 20 pounds per day. The concentration of phosphorus in most industrial effluents to Lake Michigan is below levels attainable with treatment based on current available technology. It is the state's policy to require phosphorus removal of concentrated wastes prior to mixing with high volume effluents. Steps are being taken to investigate in more detail the uses of phosphorus by industry. Public Law 174, Acts of 1971, as amended, outlaws all detergents containing phosphorus, by January 1, 1973, except for dishwater compound and specialty uses in beverage, food processing, hospitals and institutional care facilities which are exempt until April 30, 1973. The law provides that the Board may develop a program to issue permits allowing use of phosphorus detergents when no substitute exists provided treatment for removal of phosphorus is employed.

MICHIGAN

Michigan's pollution abatement program requires 80% phosphorus removal from municipal discharges to state surface waters by an outside date of 1977. Various enforcement conferences have accelerated the program in the following areas:

Lake Michigan Basin	:	80% removal by December 1972
Lake Superior	:	80% removal by January 1974
Detroit River-Lake Erie	:	80% removal by December 1971

Note: See exceptions for Detroit under IV.B.

In addition, Michigan now has a law which limits the amount of total phosphorus in detergents sold in Michigan to 8.7% or less by weight.

NEW YORK

Statement of Phosphorus Policy

A statement of New York State phosphorus policy is set out below. The policy requires reduction of phosphorus as P to 1.0 mg/l or less in all municipal discharges greater than 1.0 mgd discharging to the Lake Erie, Niagara River or Lake Ontario drainage basins including both direct and indirect discharges.

The contribution of phosphate by industry is minimal with all plants involving phosphorus or phosphate pollutants being required to reduce the concentration to the lowest possible level prior to discharge. The amount of phosphorus of industrial origin reaching international waters is minimal and not of such magnitude to be considered a problem.

The following statement is for nutrient control in wastewater effluents discharged to surface waters:

Objectives:

1. To develop and implement a plan for each designated basin to reduce, in the range of 80%, the total pounds of phosphorus based on raw waste contribution.
2. To require, in general, the maximum possible phosphorus removal on each designated basin as follows:
   (a) At all municipal plants with flows of 1 mgd or greater, and
   (b) At all privately-owned plants as needed,
   to the extent that no such discharge shall have a total phosphorus content exceeding the range of 0.5 - 1.0 mg/l as phosphorus.

Statement of Policy:

This policy shall be applied to the following basins designated by the Commissioner.

1. Effective immediately for the Lake Erie Drainage Basin with attainment of objectives -
   (a) by December 31, 1971 for direct discharge, and
   (b) by December 31, 1974 for indirect discharge.
2. Effective immediately for the Niagara River and Lake Ontario basins with attainment of objectives by December 31, 1975 for all discharges.
3. Other major basins and/or sub-basins will be so designated from time-to-time by the Commissioner.

OHIO

It has been the policy of both the Ohio Department of Health and the Ohio EPA that all municipal sewage treatment plants in the Lake Erie drainage basin of one million gallons per day or more capacity, must have phosphorus removal facilities installed and in operation by December 1973. Since April 1968, all plans for improvements to plants of 1 mgd or larger capacity in the Lake Erie watershed have included provisions for phosphorus removal. The most significant operational facility for phosphorus removal installed to date is in the City of Toledo.

Industrial waste treatment plants which have significant outputs of phosphorus are also required to install control facilities.

PENNSYLVANIA

Specific

1. All applicants for new permits to discharge sewage and industrial wastes, except for cooling waters in the Lake Erie basin must provide:
   (1) At least secondary treatment with adequate disinfection.
   (2) Phosphorus removal from the wastes to the extent that the effluent will not contain more than 1.0 mg/l phosphorus as P.
   (3) Adequate disposal of sludges containing phosphorus. (New discharges are considered to be those not listed in Appendix A of The Department of Health's Report to the Sanitary Water Board dated February 14, 1969).

2. The permits of the following municipalities and industry will be modified to require adequate disinfection, phosphorus removal from the wastes to the extent that the effluent will not contain more than 1.0 mg/l phosphorus as P and adequate disposal of sludges containing phosphorus:
   (1) City of Erie
   (2) North East Borough
   (3) Girard Borough
   (4) Lake City Borough
   (5) Hammermill Paper Company

3. The permits of the following cases will be modified to require

adequate disinfection, phosphorus removal or control in the wastes to the extent that the effluent will not contain more than 2.0 mg/l as P and the adequate disposal of sludges containing phosphorus:

(1) Albion Borough
(2) General Electric
(3) South Shore Service
(4) Albro Packing Company
(5) Gunnison Brothers Tannery.

4. Phosphorus compounds should not be added to cooling waters by the users of these waters. All industries on the basin will be notified of the phosphorus removal requirements for Lake Erie and requested to refrain from the use of phosphorus compounds in their cooling waters.

5. Dilution of raw or treated waste waters with waters that contain little or no phosphorus shall not be accepted as a substitute for treatment.

6. When municipal sewer service becomes available, the permits of existing waste dischargers listed in Appendix A of the Department of Health Report to the Sanitary Water Board, dated February 14, 1969, that are not now required to remove phosphorus will be modified to require phosphorus removal to the extent that the total phosphorus content of the effluent will not exceed 1.0 mg/l as P and shall provide for the adequate disposal of sludges containing phosphorus.

WISCONSIN

Municipal Sewage

The LMEC report of September 19, 1972 indicates that 52% of Wisconsin's sewered population in the Lake Michigan basin is in compliance with the phosphorus removal requirement. Since that report was compiled, both existing compliance and what can be expected by the December 31, 1972 deadline have been re-evaluated. This leads to the following conclusions:

1. A 56% reduction in phosphorus tributary to municipal treatment plants in the Wisconsin portion of the basin is being achieved today, and this figure does not include the inherent (though admittedly small) removal efficiencies in conventional treatment plants.

2. By December 31, 1972, permanent phosphorus removal facilities were removing 69% of the total phosphorus from municiapl wastes - and this figure does not include those communities which will be installing temporary (interim) facilities.
3. Assuming an 80% removal efficiency for those plants which will install interim facilities (85% is the ordered objective for permanent installations), total phosphorus reductions as of December 31, 1972 amounted to 81.2% for the basin as a whole, thus achieving the preliminary goal of the Conference.

Of the 44 municipalities in Wisconsin ordered to install phosphorus reduction facilities, four are at or near the desired efficiency. Statistically, 16 will have permanent facilities in operation by December 31; 20 will have temporary facilities on line; and 8 have not yet indicated to the agency whether they will meet the deadline. The picture with respect to phosphorus control is clearly much brighter than would have been predicted only a few months ago. Three municipalities in the Wisconsin portion of the Lake Superior basin currently have 85% phosphorus removal requirement due to be on-line by December 31, 1974.

Industrial Wastes

At the present time, no industries in either the Lake Superior or Lake Michigan basins are under orders to remove phosphorus.

ONTARIO

Municipal Sewage

By 1975, the Government of Ontario expects to have in operation controls at more than 200 municipal wastewater treatment plants across the province serving some 4.7 million persons. This represents about 90% of the population serviced with sewers. Phosphorus removal facilities must be installed and operational in 75% of these plants by the end of 1973. The program is in response to the International Joint Commission recommendations as embodied in the Great Lakes Water Quality Agreement. The program makes provision for nutrient control in the Upper Great Lakes and in prime recreational waters where the need is demonstrated or where emphasis is placed upon prevention of localized eutrophication. Concurrently, the Government of Canada, under terms of the Canada Water Act (1970), enacted a policy calling for a staged reduction in the phosphorus content of detergents to a limit (by weight as P_2O_5) of 20% by August 1970; and 5% by January 1, 1973.

Phosphorus removal facilities must be operational at wastewater treatment plants by December 31, 1973 in the most critically affected areas of the province, including all of the plants in the Lake Erie drainage basin and the inland recreational areas. The operational date for plants discharging to waters deemed to be in less critical condition, which includes plants larger than 1 mgd discharging to Lake Ontario and to the Ottawa River system, is December 31, 1975. The 1973 phase of the program will involve 156 plants of which 85 are in the Lake Erie basin and another 30 in the Lake Huron drainage basin. The capacities of these plants range from 0.04 to 24.0 mgd, serving an estimated population of 1,600,000 persons. The 1975 phase will bring into operation another 57 plants ranging in size from 0.3 to 180 mgd serving an additional 3,100,000 persons.

Existing waste treatment ranges from lagoons to activated sludge and tertiary treatment processes. In order to integrate chemical treatment into these processes, a broad program of research and individual treatability studies has been required at each wastewater treatment plant to determine the most effective treatment chemical and point of application within the plant. Under the Canada/Ontario Agreement, studies have been completed at 24 plants with an additional 67 presently in progress. Each full-scale study is of at least eight weeks duration. Major plant renovations have not been found necessary and an excellent correlation has been found from jar testing and the quantities actually required under full-scale operation.

The following notes stress some of the developments in wastewater treatment.

Treatability Studies for Phosphorus Removal

Waste treatability studies at the 42 existing mechanical treatment plants in the Lake Erie basin have been largely completed. Phosphorus removal at all existing mechanical sewage treatment and biological oxidation pond installations in the basin are expected to be in operation by the end of this year. By 1975, with the proposals for new facilities, 28 new phosphorus control installations are expected to become operational as required by the Great Lakes Water Quality Agreement.

Batch Treatment of Oxidation Ponds for Phosphorus Control

Recent studies of pollutant removal rates by batch treatment with ferric chloride, alum and lime at six municipal sewage oxidation ponds have proven to be very successful. Treated effluent characteristics with biochemical oxygen demand (BOD_5) and suspended solids levels less than 10 mg/l accompanied by phosphorus levels of 0.5 mg/l confirm the effectiveness of this type of control. As a result, the Ministry now expects that all existing lagoon installations in the lower lakes basin will be equipped to provide for phosphorus control by December 1973.

Phosphorus Reductions Possible with Chemical Treatment

In a series of projects involving both primary and secondary treatment plants, it has been demonstrated that an effluent level of 1 mg/l of phosphorus is technically feasible with the addition of chemicals to either primary or secondary treatment facilities. The results to be achieved are dependent on the amount and type of chemicals used and of course the characteristics of the waste.

Studies employing chemical coagulants with primary treatment facilities have been completed at both Sarnia and Windsor. At Sarnia, it has been demonstrated that ferric chloride is effective in reducing phosphorus to meet the requirements of the Agreement.

In the full-scale studies at Windsor using combinations of alum and heavy molecular weight polymers, demonstrated BOD, suspended solids and phosphorus removal rates ranged as high as 72, 90 and 93% respectively. These findings will be used in process designs to achieve compliance with the requirements of the Great Lakes Water Quality Agreement.

Sludge Disposal Practices

As a result of studies commenced at the University of Guelph concerning the use of sludges on soils, a set of sludge disposal guidelines has been recently published by the Ministry. The guidelines provide direction for the handling of sewage sludge to avoid offence or nuisance conditions and include minimum distances from water supplies, residences and development as well as acceptable rates of addition to crops.

Effluent Polishing

Studies are underway to improve effluent quality by unit processes which include filtration (with and without chemical addition), up-flow clarification and activated carbon.

Spray Irrigation

A spray irrigation and spray runoff study irrigating lands with and without crop cover is being carried out at Smithville in the Lake Ontario basin. The project, involving irrigation of a wheat crop, was begun in 1972. The evaluation of runoff from a nearby uncropped plot indicated 60-70% reduction of phosphorus with little effect on the receiving streams. This project is continuing and further results will be published as soon as these become available.

Use of Waste Pickle Liquor

Projects are proceeding at Dunnville and Chatham on the use of waste pickle liquor from steel product manufacturing operations. Initial studies indicate that use of this problem waste will be helpful in achieving required phosphorus controls at a considerable saving to the municipality.

Biological Nitrification - Denitrification

This project was commenced in 1972 at Newmarket and consists of a pilot scale as well as full-scale evaluation of nitrogen removal through the biological nitrification-denitrification process.

Phosphorus Control Project Costs

When the initial capital estimates were made for the first IJC report on the lower lakes, some $40 million were considered to be necessary to satisfy needed phosphorus controls in Ontario. Through the applied research effort of the past year, these costs have been reduced to $15 million for the lower lakes, as it has been generally found that the major additional unit treatment facilities can be limited to expenditures on chemical storage, pumps and piping, as advantage can be taken of existing treatment units. From an operating cost point of view, some excess sludge is produced which ususally requires modified sludge hauling arrangements because of the more liquid nature of the sludge. The amount of extra sludge produced is dependent upon the characteristics of the sewage and the coagulant chemicals used. Operating costs for sewage treatment are expected to increase by a factor no greater than two.

Industrial Wastes

Based on the information available, it has been concluded that industrial wastes are not a significant input of phosphorus in the direct discharges of the Great Lakes. In this light, with one exception, programs specifically for the reduction of phosphates have not been developed. The exception is a phosphate fertilizer plant discharging to the Lake Erie watershed.

There are less than 10 industries discharging in excess of 100 pounds of phosphorus per day, and in most cases, the effluent volumes are of such magnitude, 50 million to 800 million gallons per day, that the precision of the sampling and laboratory techniques cast doubt on the reliability of the data calculated as net loadings.

In spite of not having programs directly related to reducing phosphates in direct discharges to the Great Lakes, reductions are expected as the result of other items in the Provincial Control Program. Many industries, as the result of local conditions where objectionable algal growths occur or are predictable, are being requested to provide phosphate treatment. These are usually industries with biological treatment, and the phosphate removal process is expected to be the same, and as effective, as that being instituted at municipal sewage treatment plants. One adverse effect is that some industries must add phosphorus to ensure efficient operation of the biological treatment system. However, the number of plants involved is very small.

Additional phosphate control is expected from the continuing program of dealing with individual point sources. The most common ones encountered are the blow down from boilers and from re-circulated cooling water systems. The alternatives are to use alternate chemicals or to treat such discharges.

Land Drainage

Control programs for sources of pollution arising from the use of land and other resources and materials which may contribute to eutrophication are embodied in the Waste Management Program of the Ministry of the Environment. This includes programs and measures for the control of municipal solid wastes, including sewage sludge, industrial and hauled liquid wastes, animal wastes, pest control products, hazardous substances, and guidelines for dredging, filling and construction activities.

GROSS INPUTS OF PHOSPHORUS

SUMMARY OF EUTROPHICATION OF THE GREAT LAKES

Based on the programs described; tables 11 and 12 are a summary of gross inputs of phosphorus and reduction in loadings to the Great Lakes. Table 11 displays the loadings and reductions to the Upper Great Lakes, Superior, Huron and Michigan which are presently being sought as per Annex 2, para. 8 of the Agreement. These loadings and reductions were developed by the International Reference Group to study pollution problems of Lake Huron and Lake Superior.

The summary for Lakes Erie and Ontario, table 11, indicates the programs presently in effect are achieving the reductions as agreed to in Annex 2, para. 4 of the Agreement. However, a critical review of the method of calculating the loadings to the systems should be undertaken in order to maintain uniformity when reporting loading data.

Table 12 summarizes the total loadings of phosphorus and reduction in loadings to the Great Lakes system.

TABLE 11

PHOSPHORUS LOADINGS TO THE GREAT LAKES
INCLUDING PROJECTED 12 MONTH REDUCTION IN LOADINGS

(Short tons per year)

UPPER GREAT LAKES

	Lake Superior *		Lake Michigan		Lake Huron	
	1972	1973	1972	1973	1972	1973
United States						
Baseloads	1,480	1,505	7,765	7,925	1,535	1,565
Reduction	-0-	-0-	1,790	2,095	-0-	115
Residual Load	1,480	1,505	5,975	5,830	1,535	1,450
Canada						
Baseloads	905	920			1,345	1,380
Reduction	-0-	95			-0-	130
Residual Load	905	825			1,345	1,250
Totals Lakes Superior and Michigan						
Baseloads	2,385	2,425	7,765	7,925		
Reduction	-0-	95	1,790	2,095		
Residual Load	2,385	2,330	5,975	5,830		
Input from Lake Superior					975	975
Input from Lake Michigan					255	255
Total for Lake Huron						
Baseload					4,110	4,175
Reduction					-0-	245
Residual Load					4,110	3,930

* Total phosphorus discharged to Lake Superior by Reserve Mining Company at Silver Bay is not included because the amount of available phosphorus as a nutrient has not been determined.

TABLE 11 (CONTINUED)

PHOSPHORUS LOADINGS TO THE GREAT LAKES

LOWER GREAT LAKES

	Lake Erie			Lake Ontario		
	1971	1972	1973	1971	1972	1973
United States						
Baseloads	25,800	26,400	27,000	6,900	7,000	7,200
Reduction	100	10,160	11,085	-0-	675	1,190
Residual Load	25,700	14,240	15,915	6,900	6,325	6,010
Agreement**	25,700	21,200	17,200	6,900	6,500	6,700
Canada						
Baseloads	3,300	3,300	3,400	6,700	6,900	7,000
Reduction	100	1,200	1,400	400	1,800	2,000
Residual Load	3,200	2,100	2,000	6,300	5,100	5,000
Agreement	3,200	3,200	2,800	6,300	6,500	5,200
Input from Lake Huron	2,300	2,890	2,300			
Total for Lake Erie						
Baseload	31,400	32,590	32,700			
Reduction	200	11,360	12,485			
Residual Load	31,200	21,230	20,215			
Input from Lake Erie				4,800	4,670*	4,375*
Total for Lake Ontario						
Baseload				18,400	18,565	18,575
Reduction				400	2,975	3,190
Residual Load				18,000	15,590	15,385

*This value is at best approximate because the analytical values used for calculation are not sufficiently precise in comparison to the magnitude of the flow in the river.

** Canada - U.S. Agreement projection.

TABLE 12

PHOSPHORUS LOADINGS TO THE GREAT LAKES INCLUDING PROJECTED 12 MONTH REDUCTION IN LOADINGS

(Short tons per year)

TOTALS FOR THE GREAT LAKES

	1971	1972	1973
Lake Superior			
Baseload		2,385	2,425
Reduction		-0-	95
Residual Load		2,385	2,330
Lake Michigan			
Baseload		7,765	7,925
Reduction		1,790	2,095
Residual Load		5,975	5,830
Lake Huron			
Baseload		4,110	4,175
Reduction		-0-	245
Residual Load		4,110	3,930
Lake Erie			
Baseload	31,400	32,590	32,700
Reduction	200	11,360	12,485
Residual Load	31,200	21,230	20,215
Agreement**	31,200	26,700	22,300
Lake Ontario			
Baseload	18,400	18,565	18,575
Reduction	400	2,975	3,190
Residual Load	18,000	15,590	15,385 *
Agreement**	18,000	17,800	16,700

* - This value is at best approximate because the analytical values used for calculation are not sufficiently precise in comparison to the magnitude of the flow in the river.

** Canada-U.S. Agreement Projection.

IV - SECTION D - POLLUTION FROM LAND USE ACTIVITIES

SUBSECTION 1 - CONTROL OF PEST CONTROL PRODUCTS

CANADA

Regulations pursuant to the Pest Control Products Act came into effect on November 27, 1972. These regulations, which are administered by the Department of Agriculture contain the usual requirements for information on the product for registration purposes and for use. The regulations also contain specific provisions requesting information on the effects of the control product on non-target organisms; the degree of its persistence; retention and movement of the control product and its residues as some of the environmental factors which must be considered prior to applying for registration from the Department of Agriculture.

A study is currently underway in London by Canada Department of Agriculture scientists into transport of pesticides, with emphasis on DDT, in sediments and silts from the land to the water environment. Three different small watersheds involving urban, farm and cottage developments are being studied.

UNITED STATES

Approximately 34,500 pesticide products are currently registered with the Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA). Farmers usesthe largest volume of pesticides but about half of the registered products are utilized by persons other than farmers.

Problems associated with pesticide usage have been revealed through extensive State-Federal pesticide monitoring programs. For example, epidemiological studies of human case subjects in areas of heavy pesticide usage have indicated critical build-ups of DDT and other chlorinated hydrocarbon residues in human tissue.

Soil profiles monitored in 36 states and 5 urban areas similarly revealed alarmingly high pesticide residues. Companion projects have calculated chemical residues in fish, natural lakes, rivers and streams.

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Information obtained from the above studies has influenced pesticide usage. In 1971 EPA indicated registration cancellation proceedings against DDT, Mirex, 2,4,5-T, aldrin and dieldrin. After extensive hearings on June 14, 1972, EPA banned nearly all uses of DDT. Because of DDT persistance in aquatic and terrestrial environments, its insolubility in water, and accumulation in the food chain, extensive training programs are anticipated in 1973 in which chemicals other than DDT will be reviewed in University extension programs.

Public concern over pesticide misuse prompted the President to transmit a proposed Federal Environmental Pesticide Control Act to Congress in February 1971. The Act, signed by the President on 21 October 1972, amends the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1947. Full implementation of the Act will require four years.

The new Act combats pesticide pollution in many ways but major provisions include:

1. Classification of pesticides into general use or restricted categories.
2. Strengthening of enforcement policies.
3. Establishment of pesticide packaging standards.
4. Certification of pesticide applicators by the State.
5. Establishment of disposal regulations for excess pesticides and pesticide containers.
6. Establishment of effective dates for implementing the Act.

In his 1972 Environmental Message, the President reiterated his concern in reducing environmental contamination by pesticides by initiating a series of actions to encourage integrated pest management, that is, controlling insects by other than pesticide applications. This approach calls for maximum use of natural pest populations such as predators, parasites, pest specific diseases, chemosterilants, sex attractants and radiation for insect control.

EPA has instituted several measures to minimize pesticide impact on public waters, public health, and the environment including:

1. Cancellation and suspension of pesticides too dangerous for their intended uses.
2. Increased market surveillance to enforce pesticide residue tolerances.

3. Restricting the use of dangerous pesticides to certified applicators.
4. Providing technical assistance and funds for environmental surveillance, monitoring of accidents and research.

Pesticide specialists have identified the disposal of excess pesticides and used pesticide containers as major contributors to environmental pollution. Disposal regulations are being developed and should be implemented in the near future.

Water Quality Improved by EPA Pesticide Control Programs

EPA pesticide use programs along with safe waste disposal and monitoring will improve water quality of streams and lakes. However, soil erosion must also be effectively controlled.

Registration and establishing of tolerances are influencing use of dangerous chemicals and facilitating market surveillance. Market surveillance facilitates enforcement of use regulations and accumulation of safety information for each pesticide used in the area.

Research on specific pesticide products is constantly providing information on safety and efficiency of use. Also, research conducted on pesticides and their effects on human health, animals and aquatic life continues to provide valuable information for our protection.

As may be seen in the appended table of recent pesticide data for Lake Ontario-St. Lawrence Drainage Basins, most water quality analyses have proven negative or very low in concentrations, though samples were taken in the critical period. This is true even for Eighteenmile Creek, Johnson Creek, and the Salmon River which flow through the fruit producing belt along Lake Ontario.

ILLINOIS

Environmental investigations have revealed the existence of potentially harmful contaminants in the aquatic ecosystem. Chlorinated hydrocarbon pesticides, of which DDT is the most widely known example, fall into this classification. Heavy metals, including mercury, are another group of contaminants of environmental concern. Of more recent concern are several chemical compounds which have only recently been identified in the aquatic ecosystem and which have potentially significant environmental impact. These chemicals are polychlorinated biphenyls and phthalates.

Pesticides

On June 25, 1969, the Pesticide Control Law was passed in Illinois. The act provided for labelling of pesticides to prevent contamination of water and environment by regulation, restricting or prohibiting the sale, use or application of pesticides. The sale, use or application of DDT was prohibited in Illinois without a permit from the Director of the Department of Public Health, effective January 1, 1970.

Chlorinated hydrocarbon pesticides are undesirable in the environment because they may persist for months and years following application. In 1971, analyses were performed for Total DDT (p, p' - DDD) + (o, p' - DDD) + (p, p' - DDT) + (o, p' - DDT) + (p, p' - DDE) + (o, p' - DDE), Heptachlor epoxide, Dieldrin, Methoxychlor, Lindane, Heptachlor, Aldrin and Endrin.

Polychlorinated Biphenyls

The polychlorinated biphenyls have recently been found in Lake Michigan,water, sediment and fish. PCB's, which are extremely persistent chlorinated hydrocarbons, have been found to accumulate through food chains of fish and birds, and may have an effect on reproductive potential.

PCB's are used in the production of adhesives, asphalt, elastomers, electrical insulation, fire-resistant heat transfer and hydraulic fluids, special lubricants, sealants and expansion media, synthetic rubber, floor tile, printers ink, coatings for paper and fabrics, pigments, resin, paints, varnishes and waxes.

Phthalates

Phthalates are a second class of chemical compounds of recent environmental concern. They are used as plasticizers in the plastics industry, particularly in the production of polyvinyl chloride plastics.

Two phthalate esters, DOP (ethylhexyl phthalate) and DBP (n-dibutyl phthalate), have been encountered in the routine analysis of Lake Michigan water for DDT. Subsequent investigations have confirmed the presence of phthalates in fish, especially those taken from bodies of water associated with large urban and industrial areas.

INDIANA

In 1971, the Indiana General Assembly enacted a law regulating the distribution, sale and use of pesticides and providing for the appointment of a Pesticide Review Board.

The law specifies that all pesticides offered for sale in the State or transported within the State are to be registered in the office of the State Chemist.

The Board may after a public hearing, by regulation, adopt a list of "restricted use pesticides" and "pesticides for use by prescription only" for the State or for designated areas within the State if it finds that the characteristics of such pesticides require that regulations restricting their sale, distribution, or use by any person are necessary to prevent undue hazards to persons, animals, wildlife, crops or vegetation other than the pests or vegetation which they are intended to prevent.

The Indiana Stream Pollution Control Board will work with the State Chemist and the Pesticide Review Board to insure that pesticides are used in a manner that will not result in pollution of streams in the Great Lakes Basin.

The results of a pesticide monitoring program carried out by the State from the fall of 1969 to September 1971 indicate that there is not a significant pesticide problem in the Indiana portion of the Great Lakes Basin.

MICHIGAN

Since the 1949 passage of the Economic Poison Law all economic poisons, as defined by the law, sold in Michigan have to be registered with the Department of Agriculture. This law regulates the transportation, distribution, and sale of economic poisons as well as insuring proper labelling of economic poisons.

In October, 1970 an economic poisons advisory committee was formed with representatives from the Departments of Agriculture, Public Health, Natural Resources, and Water Resources and Michigan State University.

An inter-agency Agreement for Economic Poison Label Review was made and a member of each state agency reviewed all labels of economic poisons proposed for registration during the following year (10-70 to 10-71). This review continues for labels of all new products for which registration is requested.

In March, 1972 a restricted use pesticides regulation was passed. This regulation provides for the identification of restricted use pesticide formulations to be sold only by licensed dealers and those formulations which may be sold by licensed dealers only to licensed economic poison applicators or representatives of governmental agencies. It also provides for the licensing and examination of persons in charge of sales locations where restricted use pesticide formulations are sold and the reporting of sales of such formulations.

MINNESOTA

Pesticide monitoring has been in effect since 1964. In 1969, the MPCA released a report which indicated that pesticide residuals were still a cause for concern, although DDT levels appeared to be declining. In that same year (1969), the Agency participated as a member of the Pesticide Advisory Board, which contributed to the development of expanded regulations on restricted use pesticides issued by the Minnesota Department of Agriculture in mid-1970. These regulations restricted the sale, use and distribution of DDT and several other compounds.

In late 1970, a study entitled "Pesticide Inputs and Levels in Minnesota Waters of Lake Superior Basin" was completed. Since then, the study of the role and effect of pesticides has been continued as a regular program activity of the Agency's Division of Special Services.

NEW YORK

The State has regulated the use of many pesticides to the extent of banning some of them from the market and establishing complete control over the use of certain others.

Since January 1, 1971, the Bureau of Pesticide Control has administered three laws which have an effect, in one way or another, on the water quality of the Great Lakes System. The Bureau, through its field inspectors, insures that all pesticide products used in the state are registered with the Department. This insures access to all test data regarding pesticides used in the Great Lakes drainage system. The Department, through the Bureau, has also restricted certain hazardous and environmentally dangerous pesticides. This program limits the use of these materials to specific locations for specific uses. The Department has also prohibited the use of ten specific pesticides, most of which are considered to be environmental pollutants. Between the prohibition and restrictions, the types and volumes of pesticides reaching the Great Lakes has been substantially reduced. The Bureau also administered a program requiring the issuance of a permit prior to the direct application of a pesticide to water. All applications for such permits are thoroughly reviewed and in some cases, notably where the pesticide is to be used on a bay or estuary of one of the Great Lakes, the permit has been refused. All of these programs should have had a beneficial effect on the water quality of the Lakes where it pertains to pesticides.

OHIO

See description of program for Persistant Organic Chemicals, Chapter IV, Section B.3.

PENNSYLVANIA

Application of pesticides directly to the water for algae or fish control is regulated by a permit system.

WISCONSIN

The State of Wisconsin has current legislation concerning the registering and labeling of pesticides under Chapter 94 of the Statutes. The Wisconsin Department of Agriculture has further promulgated rules known as Ag. 29 which also regulates registration and labeling activities.

Chapter 146 of the Statutes creates a Pesticide Review Board and authorizes the Department of Agriculture, Department of Natural Resources, and Department of Health and Social Services to promulgate rules concerning pesticide use restrictions. The Department of Natural Resources has promulgated NR 80 which declares nine restricted use pesticides that may not be used without a permit. Furthermore, NR 80 requires all applications of pesticides to forest and non-crop lands to be reviewed by the Department of Natural Resources.

Ag. 29 regulates the storage of pesticides as well as the disposal of excess pesticides and pesticide containers. It further declares a "prohibited use" list of pesticides where use can be authorized only by a Review Board.

Chapter 426, Laws of 1969, prohibits the use of DDT except for public health purposes and certain other exceptions.

Wisconsin currently has no applicator license law, but Ag. 29 requires commercial applicators to register with the Department of Agriculture.

The Pesticide Council is in the process of developing commercial applicator regulations and regulations to log toxic chemicals.

ONTARIO

The legislation for the control of pesticides in Ontario is contained in two Acts, namely - The Pesticides Act and the Environmental Protection Act. In conjunction with the administration of this legislation monitoring is done from eight sampling points in the province, four times a year. Samples are taken from the same source each time. Commodities sampled are, milk, avian fat, porcine fat, beef fat, eggs, potable water and surface water. The original purpose of this monitoring which started in 1968, was to check the levels of the persistent organochlorine insecticides in the environment.

The Pesticides Act provides for the licensing of all commercial applicators of pesticides as well as persons who apply herbicides, persistent organochlorine insecticides and high hazard organophosphorus insecticides on their own premises or the premises of their employer. Crown and municipal employees are subject to this but farmers are exempt. Specific sections are included in this legislation prohibiting the washing of sprayers in rivers or other bodies of surface water and also prohibiting the drawing of water from rivers or the bodies of surface water unless the sprayer is equipped with an approved device to prevent back syphonage. Provision is made where a pesticide is inadvertently dumped in surface water that the

Director and the local medical officer of health must be notified immediately.

New regulations and licensing procedures designed to further tighten the control of pesticides, and to keep the more toxic of these substances out of the hands of non-professional people, came into force in the province on January 1, 1973. Under these new provisions, retail outlets for the more toxic pesticides will be licensed, with the licence indicating the class or category of pesticide that the outlet is permitted to sell and to whom the pesticide may be sold. Those pesticides which are on a restricted list will be available only on a specific-use permit and the outlet selling them will have to keep complete sales records. The new licensing rules will not only prevent the abuse of pesticides by inexperienced people but will ensure that these pesticides are channelled solely to those areas where they are vitally necessary.

IV - SECTION D - POLLUTION FROM LAND USE ACTIVITIES

SUBSECTION 2 - CONTROL OF POLLUTION FROM ANIMAL HUSBANDRY

UNITED STATES

The U.S. Environmental Protection Agency believes that recycling animal wastes back onto the land is the best practicable approach in most situations, particularly for small operators, through the use of catchment basins, lagooning systems, and/or solid waste handling techniques. There are also other possible uses which should be given full consideration. Testimony presented to the President's Water Pollution Advisory Board indicates that promising possibilities exist in converting animal wastes into useful products and in recycling back into animal feeds.

The U.S. Department of Agriculture's Rural Environmental Assistance Program has been discontinued effective December 22, 1972 due to the President's budget cuts. All programs funded prior to that date will continue to operate until funds are exhausted. The entire program will probably be phased out by the end of the year.

ILLINOIS

Illinois is currently proposing regulations for control of pollution from animal waste operations. These are in public hearing with approval anticipated in 1974. The Pollution Control Board held extensive hearings on nutrient contribution to water pollution in 1971 and 1972. The Board concluded after reviewing the written record on these hearings that there was insufficient data available to establish plant nutrient regulations. They therefore requested the Institute for Environmental Quality to review the contribution of plant nutrient to pollution of the waters of the State and propose regulations. It is anticipated that in early 1974 the Institute will have enough data available to suggest some plant nutrient regulations.

All sources of pollution in Illinois are regulated by the Water Pollution Regulations approved by the Board in March 1972; therefore, specific regulations on plant nutrients and animal feedlot operations are not necessary to control these sources.

INDIANA

On April 2, 1971, a confined feeding law, IC 1971, 13-1 became effective. This law defines confined feeding operations and requires that all operations exceeding 300 cattle, 600 swine or sheep, and 30,000 fowl, and those smaller operations causing violations of the Stream Pollution Control Law or Stream Pollution Control Board Regulations (SPC 1R-2, SPC 7R, SPC 4R and SPC 12), must receive approval of waste handling facilities from the Board. The Law further provides that all existing confined feeding operations over the numbers listed above must submit information on waste disposal practices to the Board by July 1, 1973 for consideration. This will provide an inventory of all operations above the indicated numbers.

MICHIGAN

Farm Wastes

A coordinated program has been developed between the Water Resources Commission, the Soil Conservation Service and the Agricultural Stabilization and Conservation Service to reduce pollution of water by farm wastes. An Extension Bulletin, E-720, has been prepared by the Agricultural Engineering Department and Cooperative Extension Service of Michigan State University and is distributed to farm operations to assist in planning waste control.

Meat Processing Plants

The Michigan Water Resources Commission staff acts as consultant to the Michigan Department of Agriculture with respect to the wastewater disposal facilities for meat processing plants under the jurisdiction of that agency. It has been policy to require a letter of approval from the

Water Resources Commission at all establishments where the wastewater treatment facilities are questionable.

Feedlots

Livestock feedlots are considered to be commercial enterprises and subject to the Statement of New Use and Order of Determination provisions of Act 245, P.A. of 1929, as amended.

MINNESOTA

In April 1971, the MPCA promulgated regulations for the control of wastes from livestock feedlots, poultry lots and other animal lots. Those regulations indicate that all new feedlots started after April 16, 1971 are required to obtain a permit. Also, any existing feedlot which has a "potential pollution hazard" is required to obtain a permit after corrective measures have been taken. In addition, for the next one to two years, the Division of Solid Waste has developed a program of inventory and registration for all feedlots in the State. Presently, feedlots which may be a "potential pollution hazard" are investigated when complaints are filed with the Agency. There are no known feedlots in the Lake Superior Basin.

A tentative goal for the statewide feedlot registration and permit program is to have no discharge into water and to have animal wastes recycled to the land.

NEW YORK

The state of New York has, for several years, been working in cooperation with the U.S. Department of Agriculture in a remedial program known as the "Rural Environmental Assistance Program (REAP)". The purpose of this program is to emphasize practices and priorities which result in general public and specific community-wide benefits with special emphasis on the reduction of agriculture related pollution problems.

Among the many federally funded REAP projects approved for 1973 are:

(a) Constructing Sediment Retention and Water Control Structures

(b) Disposal Pits for Solid Wastes
(c) Constructing Animal Waste Storage and Diversion Facilities
(d) Streambank or Shore Protection
(e) Controlling Sediment and Chemical Runoff
(f) Other Pollution Abatement Practices

The federal portion of funding for these practices range from 50-80% of the cost.

The purpose of these practices is to reduce phosphorus, Nutrients and Sediments from animal barnyards, feedlots, holding areas or similar sources from which the runoff constitutes a material pollution hazard.

REAP was discontinued effective December 22, 1972 but all programs funded prior to that date will continue.

OHIO

The State of Ohio has an agricultural waste program designed to reduce pollution and aid the farmer in his efforts to provide facilities. Improved abatement programs result from better management of present facilities along with the installation of new or improved equipment. Agricultural wastes are given the same consideration as industrial and municipal wastes under the Ohio EPA Bill. Where the farmer has a point or source discharge from the property, he will find it necessary to comply with present stream standards as equally applied to all entities. The present agricultural program includes a series of panel discussions throughout the State before various farm groups. Considerable time is given to the proper design and selection of acceptable facilities. Also stressed throughout our program is the proper management of treatment facilities. In many cases better operation can alleviate the need for additional facilities. The Ohio program works in cooperation with the U.S. Department of Agriculture Soil Conservation Service and the Ohio State University Extension Service. In this way, the most recent equipment and facility design are being reviewed and evaluated. An agent is placed in each county to maintain constant communication with the farmer.

PENNSYLVANIA

Animal husbandry wastes are sewage as defined by the Clean Stream

Law. There are no major sources at present. Land disposal with holding tanks for inclement weather is the preferred practice.

WISCONSIN

In an effort to control the pollution problems that can result from improper animal waste management, the Department of Natural Resources proposed animal waste management rules in early 1972. The proposed rules were prepared by the Department in cooperation with an advisory committee whose membership includes farmers, agri-businessmen, University of Wisconsin scientists and engineers, plus representatives of the USDA-Soil Conservation Service, USDA-Agricultural Stabilization and Conservation Service, Wisconsin Department of Agriculture and Wisconsin Department of Health and Social Services. The purpose of the proposed rules was to provide livestock producers, agri-businesses and public entities a basis for making sound management decisions which are compatible with water resources statutes. The proposed rules were primarily concerned with controlling surface and groundwater pollution problems associated with manure storage systems, feedlot runoff, streams flowing through barnyards and winter manure spreading near streams. After a series of educational meetings, six public hearings were held at various locations throughout the state in March, 1972. A large number of farmers appeared at the hearings and were generally in opposition to the proposed rules.

Since the public hearings, a transcript and a summary of the hearings have been prepared. The proposed rules are being revised to reflect the comments received at the hearings. The Department is presently developing an animal waste management educational program to be held this winter in cooperation with the University of Wisconsin Extension. More public hearings must be held before any proposed animal waste management rules become effective. These hearings must be held by the Wisconsin Legislative Committees on Agriculture. The proposed rules must be approved by the Legislature before they can become law.

At the present time, the Department is handling animal waste problems on a case-by-case basis and, when necessary, enforcement actions have been taken. In addition, when a farm owner or operator is seeking assistance in solving an animal waste management problem, the Department will advise the farmer on the environmental considerations and work closely with the University of Wisconsin Extension agents and USDA-Soil Conservation Service specialists or dairy plant fieldmen who may also be assisting the farmer.

ONTARIO

Intensive livestock and poultry enterprises produce large quantities of waste which contain significant quantities of phosphorus. The Ministry of Agriculture and Food and the Ministry of the Environment have prepared a Code of Practice relating to the recommended procedures for the control and disposal of animal waste. By means of proper storage capacity and the spreading of animal wastes on adequate land area in non-winter months, the problem of phosphorus admission to receiving waters can be effectively controlled. The co-operation of the farm community is an integral part of this program.

It is not possible to quantify the reduction of phosphorus likely to take place from such a program.

IV - SECTION D - POLLUTION FROM LAND USE ACTIVITIES

SUBSECTION 3 - DISPOSAL OF SOLID AND LIQUID WASTES

CANADA

Pollution of the Great Lakes from land management practices on adjacent lands may arise from both agricultural and municipal waste disposal operations. The effects of agricultural wastes are dealt with elsewhere. In the Ontario region, such pollution may occur from surface run-off or sub-surface drainage and leaching, with flows either direct to the Lakes, or to the rivers draining and discharging to them.

Most domestic solid wastes are disposed of on land. Incineration accounts for only a small portion of the total wastes generated, but the residues, though considerably reduced in volume, must still be disposed of on land. While leachates from such landfill operations are significant contaminants, proper location, design and operation of sanitary landfills can obviate problems. It is only in recent years, however, that close attention has been paid to such requirements, and it is likely that many older operations are contributing to stream pollution.

Municipal operations are carried out within the framework of provincial legislation. The Federal Government has no jurisdictional powers in municipal solid waste management. Consequently, an inventory of existing operations which might affect the Great Lakes has to be undertaken in conjunction with the appropriate Provincial authorities. Measures to correct adverse situations, whether by relocation or upgrading design and operation are primarily the concern of the municipal and provincial authorities.

A study recently completed reports on field studies on groundwater contamination from sanitary landfills in several communities in the Grand River Basin.

UNITED STATES

The Office of Solid Waste Programs of the Categorical Programs

Division has developed programs and objectives to achieve the adoption and implementation of satisfactory solid waste management practices in the Great Lakes Basin. These programs are being carried out under the provisions of the Federal Solid Waste Disposal Act (89-272) as amended by the Resource Recovery Act of 1970 (91-512). In summary, the basic program includes the following activities:

(a) Determination of the magnitude and scope of the problem. (National Survey of Community Practices and Solid Waste Facilities)

(b) Development of State Solid Waste Management Plans.

(c) Development of local and regional Solid Waste Management Plans.

(d) Implementation of these plans.

The Solid Waste Disposal Act does not provide for Federal controls over solid waste management. However, the Federal Refuse Disposal Act of 1899 can be used to abate the pollution of any navigable waters resulting from improper solid waste management practices.

In an effort to encourage the early adoption of improved solid waste management, an activity titled "Mission 5000" was undertaken. The goal was to close 5000 of the Nation's open, burning dumps during a period of two years starting July 1, 1970. Although only 2,175 dumps were officially closed during this period, the activity is continuing.

No significant problems involving the degradation of waters of the Great Lakes as a result of solid waste land disposal operations have been reported.

Liquid Disposal on Land

"The Muskegon County Wastewater Management System" is a liquid wastewater treatment program that is approximately 60% constructed. This is a process by which all of the 42 million gallons of wastewater generated from Muskegon County is treated aerobically and then applied to farmland. The estimated cost is $40 million, with 55% being appropriated by the U.S. Environmental Protection Agency.

ILLINOIS

Illinois regulations require that plans for solids waste disposal facilities including land fills be approved by the Illinois EPA before construction or operation and that each such operation be licensed by EPA. Solid waste disposal facilities are inspected periodically to ensure compliance with acceptable agency operational procedures. Open dumping is prohibited.

INDIANA

Solid waste management is one of the many programs conducted by the State. In 1969 the legislature passed the Refuse Disposal Act., Chapter 359, Acts of 1969, which provided basic enabling and regulatory powers to the local units of government and the State. The Act provided that open dumps were inimical to human health and were not suitable for refuse disposal on or after January 1, 1971. The Act was again amended in 1972 to provide for enforcement by local health departments, to provide a penalty clause, and to clarify some of the original wording.

The Refuse Disposal Act specifically gives the State the authority to institute proceedings for injunctive or mandatory relief through the State Attorney General in any court of competent jurisdiction for violation or failure to comply with the provisions of the Act. During the past two years the State has initiated many successful enforcement actions.

Public Law 100, which created the Indiana Environmental Board, designated the Stream Pollution Control Board as the solid waste agency for the State in all matters relating to the Federal Resources Recovery Act of 1970.

Section 3 of the Refuse Disposal Act requires that approval shall be obtained from the State Board for any method or methods used for the disposal of refuse prior to obtaining land or facilities. The sanitary landfill is the most widely used method of refuse disposal primarily because of its relatively low cost. In order to obtain approval, a proposal for the operation must be submitted to the State Board for review. In addition to a review of the material submitted, an on-site survey is conducted of each site for which a proposal is submitted.

A hearing was held on September 11, 1972, on proposed regulation EMB-1 relative to a permit system for (1) the establishment of refuse disposal facilities, and (2) the operation of the facilities. Authorization for this action is contained in Chapter 10 of P. L. 100. Testimony at the hearing and possible revisions of the proposed regulation are under consideration at this time.

MICHIGAN

Solid waste disposal is controlled by the Michigan Department of Public Health under the provisions of Act 87, Public Acts of 1965. All waste disposal sites must be sited and constructed to prevent pollution of ground or surface waters and are licensed and inspected by the State Health Department.

MINNESOTA

Solid Waste Regulations were adopted by the Agency on January 12, 1970. These required a final solid waste management system plan to be submitted by each county in the state by July 1, 1972. All open dumps are in the process of being closed down in conjunction with a federal program; the county plans are to provide a system of sanitary landfills and other sites or facilities for the disposal of solid wastes.

NEW YORK

The disposal of solid waste in New York State has been regulated by local and State agencies under the provisions of regulations identified as 6 NYCRR PT. 360 and Title 12A Water Pollution Control.

Part 360 controls the operation of solid waste land disposal facilities and requires the approval of new sites for such new facilities. Solid waste must be compacted and covered daily. The operations must be accomplished in such a way so as not to permit contact with either surface or ground waters.

Under the provisions of Article 12A, permits are required where discharges are to be made from such facilities.

The enforcement of these regulations is the responsibility of the

NYSDEC acting through the Regional Offices and in some cases through local Health offices.

New legislation is being proposed for requiring all solid waste management facilities to be either licensed or placed under permit. Also included in this legislation will be the certification of solid waste facility operators.

Comprehensive solid waste management planning aid, detail planning aid, and construction grant aid are available to municipalities for aiding them in realizing efficient, economic, and satisfactory systems in the State.

OHIO

Ohio law requires that plans for solid waste disposal facilities including landfills be approved by the Ohio EPA before construction or operation and that each such operation be licensed by an appropriate agency. The licensing agency provides operation inspections. Open dumping is prohibited.

PENNSYLVANIA

Pennsylvania has a Solid Waste Management Law and a permit system. Land fill and other disposal sites are given a hydrologic review and standards are imposed to prevent surface and groundwater pollution from leachates.

WISCONSIN

Enactment of Chapter 83, Laws of 1967, materially strengthened the state's position in solid waste disposal through establishment of a licensing program. Pursuant to this action, solid waste disposal standards were adopted and inspection and licensing of solid waste disposal sites began in the spring of 1969. Since that time more than 1,900 disposal sites and auto salvage yards have been licensed. Confirmed by field inspections, operational conditions at the disposal sites have improved to the point where the majority are in compliance with the Solid Waste Disposal Standards. Nearly all sites that were improperly located with respect to surface or groundwater have been closed and properly abandoned.

During the three years of the licensing program, substantial amounts of data have been collected, placed in a computerized data holding system, and made available to communities or agencies seeking inventory information for planning activities. In addition, the site licensing program has been computerized to increase processing efficiency.

In late 1971 the Wisconsin Legislature enacted Chapter 130, Laws of 1971 which enables counties to plan and undertake various solid waste management activities. They may plan, establish, or operate solid waste management systems or may participate jointly with other counties, cities, villages or towns. Based on Chapter 130, solid waste management planning criteria (Wisconsin Administrative Code, Section LAD3) were adopted. The criteria, which govern the development of county and multi-county solid waste management plans, were presented state-wide to officials and to the public over the Extension Educational Telephone Network.

An information and education program was initiated by a state-wide meeting of county and local officials and technical personnel. The meeting, held in cooperation with the U.S. Environmental Protection Agency, was directed at proper dump site closure and planning and operating sanitary landfill sites.

That initial meeting was followed by a series of 40 county solid waste disposal information meetings held in selected locations throughout the state. These meetings, attended by approximately 2,100 persons from around the state, emphasized improved solid waste disposal and the need for planning and consolidating disposal systems.

To encourage communities to consider a cooperative, large-scale approach to solid waste management and to aid local and county governments in the planning of solid waste management programs, a 16 mm. color movie was produced - cooperatively by the Department of Natural Resources and the University of Wisconsin - Extension. The movie shows examples of ways many Wisconsin communities have successfully planned, organized, and co-operated in the operation of solid waste disposal systems.

As a guide to planning and intergovernmental cooperation, the movie together with two planning and technical manuals, prepared by the University of Wisconsin Extension, Department of Natural Resources, and Department of Local Affairs and Development, were presented to government officials at 10 regional information meetings throughout the state.

In relation to the handling of abandoned motor vehicles, the Wisconsin Legislature also enacted Chapter 131, Laws of 1971. This law prohibits the unauthorized abandonment of vehicles and declares that any vehicle left unattended for more than 48 hours without permission of the property owner is a public nuisance. Vehicles may be impounded by municipalities or sold directly to licensed salvage dealers if value is determined to be less than $100. and the vehicle is not stolen.

All solid waste disposal sites are being inspected and licensed. During the first two years of the program (July 1, 1969 to September 30, 1971) the majority of solid waste disposal sites were issued conditional licenses since few complied with the Solid Waste Disposal Standards. Operators with conditional licenses were required to improve their operations.

Issuance of conditional licenses was not continued during the third licensing period, which began on October 1, 1971. Only sites in compliance with the Standards, as modified by certain exemptions, are now licensed.

All salvage yards are being licensed and required to operate in accordance with the Solid Waste Disposal Standards. This has resulted in closing of approximately 100 marginal operations where the operators elected to go out of business rather than license and meet the requirements.

Collectors and transporters of solid waste are being inventoried and required to obtain annual permits in order to ensure safe and sanitary operation.

The names of known solid waste disposal site and salvage yard operators who have failed to apply for licenses or who operate in violation are being referred to the Bureau of Legal Services for legal action. Normally violators are called into informal hearings and then to formal hearings if they fail to respond. Continued violation results in the issuing of legal orders and then referral to the Attorney General if noncompliance continues.

The solid waste disposal section is working toward completion of a state solid waste management plan, after receiving an initial grant in the spring of 1971 from the U.S. Environmental Protection Agency. Background and inventory information is being collected and analyzed for development of recommendations for future statewide solid waste management activities.

To help meet the waste management needs of the state in the future the Solid Waste Disposal Standards are currently undergoing updating, revision and improvement. In general the recommended changes include a strengthening of disposal requirements, clarification and rewording of certain sections, and broadening of topics covered in order to keep abreast of recent waste management technology.

Work is ongoing for the establishment of a model sanitary landfill at the MacKenzie Environmental Center. This landfill is intended to present the basics of proper landfill operation and to demonstrate that sanitary landfill is a viable alternative to the open dump, even when small volumes of waste are involved.

Based on a report by a Governor's Task Force on Recycling of Solid Wastes, an engineering study is being conducted to plan the development of a statewide solid waste recycling program.

ONTARIO

The direction and control for the disposal of all solid wastes whether from municipal or industrial sources is the responsibility of the Waste Management Branch of the Ministry of the Environment. The Environmental Protection Act 1971, requires that all waste management systems including the hauling and disposal of designated wastes must be operated in accordance with the requirements of the terms and conditions issued with the mandatory certificate of approval. The certificates of approval are reviewed on a time period not exceeding one year and changes in conditions are made as necessary. Regulations established under the Act require adequate treatment before drainage can be allowed to discharge into watercourses and require measures to prevent the contamination of groundwater.

Forthcoming regulations will control the disposal of treated organic wastes including treated sewage sludge and the sludge from phosphate removal processes. The establishment of approved liquid waste disposal sites at Hamilton and Mississauga provides additional treatment capacity over that which exists at Corunna, Ontario.

Municipal and Industrial Solid Wastes

Since disposal sites have been generally located in the past without consideration of pollution problems, they are very frequently found adjacent to bodies of water which may be grossly contaminated as a result. Organic material, soluble salts, and alkali can cause degradation of water quality. Current control programs emphasize careful site selection and usually involve the conduct of sanitary landfill operations. By 1980 a 50% increase in the quantity of solid waste produced over current levels will require increased use of land for disposal and developments in technology to displace present inadequate methods.

Liquid Industrial Waste

Bulk liquid industrial wastes require special handling as disposal on land is often undesirable. Using economics of scale, a central treatment facility will be established in the Toronto Centred Region to handle this expensive type of operation for a large number of industries. Three major treatment streams will be provided: thermal decomposition, chemical and physical processing and biological oxidation. Resulting sludges may be incinerated or landfilled.

A major problem arises from various processes which result in very large quantities of dilute soluble salts. A good example is the brine displaced from underground gas and other storage caverns. In areas where deep well disposal of waste can be justified as a reasonable interim solution, the policy is to permit this activity only if no detrimental environmental effects result and providing underground formations of possible economic value are not impaired. Generally, the approach is to discourage deep well disposal in favour of waste reduction and surface treatment.

Hazardous Wastes

Generally this type of waste which includes fire hazards, explosives, poison or radioactivity is well handled as producers of these wastes are well aware of the risks involved. Efforts are being devoted to development of an early warning system so that full investigation of all potential hazards and means for handling and disposal can be made in advance.

IV - SECTION D - POLLUTION FROM LAND USE ACTIVITIES

SUBSECTION 4 - NUTRIENTS AND SEDIMENTS

CANADA

There are no control programs in this area, although financial assistance is available to the provinces for flood control projects, which would assist in reducing sediment loads.

UNITED STATES

Sediments

EPA is presently working with the Allen County, Indiana Soil and Conservation District in a research and demonstration project to control pollution runoff from farmlands, under Section 108(a) of the Federal Water Pollution Control Act Amendment of 1972. EPA is participating in the Minnesota Governor's Conference to develop a "Model State Act for Soil Erosion and Sediment Control". This program is being developed in coordination with the Council of State Governments, SCS, and U.S. EPA. The objective of this group is to pass legislation for soil erosion and sediment control.

Nutrients

Ten hearings on nutrient control were held by the Illinois EPA with active participation from U.S. EPA. A federal EPA policy was developed. Subsequently, over $2 million from private sources were made available to research groups to study the environmental nitrate problem.

Notable Exceptions

A program similar to the cancelled U.S. Department of Agriculture Rural Environmental Assistance Program should be undertaken by the U.S. EPA to financially assist farmers towards land use conservation and pollution abatement practices.

ILLINOIS

The Illinois portion of the Lake Michigan drainage basin is extremely small. There are no major tributaries to Lake Michigan and as indicated previously all point sources will be diverted from the Lake by 1975. The Illinois Pollution Control Board has held public hearings on nutrients as they relate to water pollution and has requested the Institute for Environmental Quality to further research this potential pollution problem.

INDIANA

Nutrient and sediment pollution contributed by agricultural runoff is a problem in portions of the Lake Michigan and Lake Erie basins. However, it is felt that considerable control can be accomplished through proper land and water management on the farms. The State works closely with the local Soil and Water Conservation Districts and encourages the development of Small Watershed Protection and Flood Prevention Projects under Public Law 566. In addition, the State encourages the use of agricultural practices that will minimize sediment and nutrient transport to tributaries of the Great Lakes.

Sediment pollution resulting from residential, commercial, industrial and highway construction is a major problem in some portions of the Great Lakes basin. Efforts to control sediment runoff from these sites have, to this point, been largely ineffective.

MICHIGAN

Michigan currently controls sediment and nutrients from land sources through the State Department of Agriculture. Current programs are generally of an educational and consultative nature with State personnel assisting land users in developing good erosion prevention techniques and proper fertilizer application.

A new bill is currently before the Michigan Legislature to: provide for the control of soil erosion; to protect the waters of the state from sedimentation; to prescribe the functions of State and local agencies; to require preparation of a State program; to provide for the promulgation of rules; and to provide remedies for violations." Action on this bill is expected in this fiscal year.

MINNESOTA

There is no established program to study nutrients and sediments in Lake Superior.

Some sediment work has been done in relation to Reserve Mining Company's operations, but only for the purpose of defining the distribution of taconite tailings.

Stream data relative to nutrients are gathered by the Section of Standards and Surveys in its normal monitoring and special investigation activities.

NEW YORK

These problems are directly associated with the control of phosphorus as outlined in IV. D. 2.

OHIO

Ohio, by a cooperative effort between Ohio EPA, the Division of Lands and Soils, Department of Natural Resources and the Ohio Department of Agriculture, is developing programs for the control of nutrients and sediments from agricultural lands. This program is just getting underway.

Contracts let by the Ohio Department of Highways include specifications requiring sediment control. The enforcement of these specifications appears somewhat questionable.

PENNSYLVANIA

Sediment and erosion control regulations were adopted by the Environmental Quality Board on September 21, 1972, together with an implementation schedule for these regulations. Training seminars for Department of Environmental Resources personnel as well as Soil and Water Conservation Districts have been held, and a series of public information seminars are scheduled. The United States Department of Agriculture, Soil Conservation Service, is working closely with DER in the training and technical aspects of this program.

WISCONSIN

The Department of Natural Resources has practiced good erosion control measures in relationship to its own activities in protecting prime streams. These techniques have included stream bank stabilization by planting trees, fencing along the bank and the use of grassed waterways. These programs have been used as demonstrations to interested groups in order to promote erosion control practices by the public. The Department has also encouraged and supported SCS programs.

Of special concern is the red clay area within the Lake Superior basin. Representatives of DNR, USDA-SCS, USGS and the University of Wisconsin have formed the Red Clay Interagency Committee. This committee has recently compiled a report and made recommendations for implementing an erosion and sedimentation control program.

Notable Exceptions

Lake Superior - Red clay area as noted above.

ONTARIO

The Ontario Ministry of the Environment (formerly the OWRC) has carried out several studies on river basins in the lower lakes area to determine the relationship between land use activities and nutrient loadings (phosphorus and nitrogen) in these streams. The following reports detail findings and recommendations arising from these studies:

1. Yields of phosphorus in the eastern Lake Ontario Region (OWRC 1968)
2. Yields of nitrogen in the eastern Lake Ontario region (OWRC 1968)
3. Land Use - Nutrient level relationships on two southern Ontario watersheds (OWRC 1969)

The erosion,movement and deposition of sediments in tributary streams and sediment discharge to the Lakes is a matter of increasing concern. Although sediment erosion and movement is often highest during the natural high flow conditions of the spring season, sizable and continuous sediment input to streams is resulting from poor land use practices, and construction in or near watercourses. The Ontario Ministry of the Environment initiated a concerted program in 1971 to review and regulate construction activity which has a potential for adding sediment to the watercourse or aggravating erosion conditions.

Guidelines have been established to cover dredging, spoils disposal, filling and other construction such as pipeline crossings or bridge crossings on inland waters and along the Ontario shoreline of the Great Lakes. These guidelines detail notification procedures, desirable construction techniques and scheduling of projects for the protection of downstream water uses. Some one hundred and fifty projects have been reviewed in 1972 and requirements placed on them. Among the control measures required are bank stabilization, scheduling of work during low flow periods and in the case of dredging or trenching activity, on-land disposal of spoils. It is recognized that some turbidity increase is unavoidable but measures can quite practicably be taken to minimize this increase. Where necessary, alternate sources of water supply must be supplied by the contractor for the protection of downstream users.

IV - SECTION E - POLLUTION FROM SHIPPING ACTIVITIES

SUBSECTION 1 - VESSEL DESIGN, CONSTRUCTION AND OPERATION

CANADA AND UNITED STATES: FEDERAL ACTIVITIES

Both the Canadian Minstry of Transport and the U.S. Coast Guard have established programs and issued some regulations for vessel design, construction, and operation, to prevent discharges of harmful quantities of oil in accordance with the principles set forth in Annex 3 of the Agreement. These regulations were issued in support of National laws in each case. The Canadian "Oil Pollution Prevention Regulations" were issued on September 21, 1971. A proposed amendment to these regulations was issued on November 30, 1972. The United States Coast Guard "Pollution Prevention Regulations - Vessels and Oil Transfer Facilities" were issued on December 21, 1972. The regulations of each country are being reviewed to ensure that they are compatible (as effective as) in achieving the objectives of the Water Quality Agreement. Both countries are considering additional regulations. However, implementing action is awaiting the outcome of the IMCO conference in 1973. A multi-national, rather than a bi-national, approach may thus be possible.

While specific regulations regarding handling and shipment of certain substances which may be hazardous are in existence in both countries, the development of compatible regulations concerning all hazardous polluting substances must await the listing of hazardous polluting substances and the determination of harmful quantities of these substances.

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IV - SECTION E - POLLUTION FROM SHIPPING ACTIVITIES

SUBSECTION 2 - CONTROL OF VESSEL WASTES

CANADA

Regulations are already in existence with respect to oil and garbage discharges, forbidding their discharge into any Canadian waters. Under the Canada Shipping Act, Part 20, contravention of such regulations carries a maximum fine of $100,000. for a single offence. Sewage regulations are prepared in draft form and will be subject to whatever standards are mutually agreed to under the Agreement. Regulations also exist in draft form which define pollutant substances and list hazardous chemicals for the purpose of shipboard carriage.

Difficulties exist however in reaching both Canada/U.S. agreement and Federal/Provincial agreement regarding standards on which compatible regulations will be based. Establishment of standards will also involve Federal/Provincial agreement on provision of shore reception facilities. For these reasons it is unlikely that compatible regulations governing the disposal of vessel wastes will be adopted by the target date of April 15, 1973.

UNITED STATES

Vessel waste regulations which are expected to be implemented in 1973 in the United States, provide for no discharge of sewage, treated or untreated, into navigable waters. The regulations become effective for new vessels two years after promulgation of implementing regulations by the United States Coast Guard, and for existing vessels five years after promulgation. The regulations provide for certain exemptions from compliance with the basic standard for existing vessels equipped with certified marine sanitation devices, which would permit operation of these devices after the effective date of the regulations for existing vessels. If any state determines that the protection and enhancement of the quality of some or all of their waters require greater environmental protection, the state may completely prohibit the discharge from all vessels of any sewage, treated or untreated, into their waters, except that no such prohibition shall apply until the Administrator determines that adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for such water to which such prohibition would apply.

The Coast Guard plans to issue proposed regulations governing the certification, installation and operation of marine sanitation devices, which implement the EPA standards, during early 1973. To meet this date, it is planned to issue proposed regulations, probably as an Advance Notice of Proposed Rule Making, within the very near future for public comment. It is hoped to resolve most of the problems early so that the actual Notice of Proposed Rule Making need provide only a minimum period for submission of comment by interested parties. Copies of pertinent portions of the Advance Proposal, as currently being reviewed, have been furnished to Canadian Ministry of Transport officials. It should be noted that the Advance Proposal has not, as yet, been published and is still under active preparation.

ILLINOIS

On January 1, 1970 the State of Illinois passed regulations prohibiting the discharge of marine toilet wastes. These regulations permit discharge of properly treated wastes to the waters. However, at the present time, adequate treatment facilities are not known and, therefore, the regulation in effect requires on-board retention of all wastes. The City of Chicago has a local ordinance which makes unlawful the discharge of marine toilet waste in Chicago harbors and in-shore waters. This ordinance is effectively enforced by the Chicago Park District which denies mooring permits to those that are not in compliance. Non-retaining type toilet systems must be officially sealed to make them inoperative while in Chicago harbors. The Park District provides free pump-out stations for servicing the retaining type toilet systems.

INDIANA

In 1969, the Indiana General Assembly enacted an amendment to the 1957 Boating Law making it unlawful to operate any boat equipped with a toilet unless the toilet is equipped with a holding tank of capacity to store wastes for subsequent disposal at approved shoreside facilities or an incinerator or treatment system approved by the Indiana Stream Pollution Control Board. This amendment brought Lake Michigan under the same restriction as had previously been applied for all other waters of the State. The law is enforced by the Enforcement Division of the Indiana Department of Natural Resources.

The Port of Indiana has two connections for collection of waste at each berth. Sanitary and galley wastes from vessels at berths within the port are pumped to a waste treatment plant on Port of Indiana property. The Bethlehem Steel Company provides portable toilets for vessels without holding tanks while they are at company docks.

None of the other companies in the area, with docking facilities, provide pump-out facilities for vessels with holding tanks or facilities for the treatment of sanitary or galley wastes from vessels without holding tanks.

Most major oil companies in the Calumet Area of Indiana pump ballast water from tankers into large heated tanks on company property. Excess oil is skimmed off and the ballast water is discharged in the vicinity of the dock.

MICHIGAN

The boat and vessel pollution control program began under 1968 Administrative Rules of the Water Resources Commission and is now under Act 167, Public Acts of 1970, which requires no overboard discharge of waste, including recreational and commercial vessels. There has been outstanding compliance by small boat owners and there are now over 150 pump-out stations located on Michigan's Great Lakes shoreline. It is the goal of the Commission to have 350 pump-out stations available to small craft by April 1974, which will mean that all marinas with 15 or more boats will have pump-out facilities.

Enforcement of the waste retention requirements for commercial vessels has been hampered because of litigation against the Water Resources Commission and the State of Michigan by the Lake Carriers Association of Cleveland, Ohio. The Lake Carriers Association, representing 19 corporations and some 200 Great Lakes vessels, has asked that Michigan be prevented from enforcing its "no discharge" program for the commercial fleet because it would "interrupt interstate shipment of goods", would "violate constitutional rights of the shippers" and would "transgress into an area pre-empted by Federal statute". On May 30, 1972, the United States Supreme Court remanded the matter back to the State courts. The case was refiled in State Circuit Court and trial is set for January 1973.

EPA has acknowledged, through recently announced vessel waste control standards, that holding tanks and retention systems are the final answer to this problem. It is feared, however, that the permitted use of rudimentary flow through treatment systems for an extended period may act to reverse the no-discharge programs already underway.

MINNESOTA

Minnesota Laws of 1971, Chapter 861 and Extra Session, Chapter 17, amended Minnesota Statutes 1969, require that all wastes from marine toilets be "retained for disposition on land by means of facilities constructed and operated in accordance with rules and regulations adopted by the State Board of Health and approved by the pollution control agency of the State of Minnesota."

Wastewater

As of August 23, 1971, there were 1871 sewage retention systems/marine toilet facilities in the state.

Coordinated Surveillance and Enforcement

Surveillance and enforcement is carried out by the sheriffs of each county and by conservation officers of Minnesota Department of Natural Resources (DNR).

DNR gives them a list of such marine toilets as are acceptable to MPCA; applicants for a boat license must have an approved toilet.

Violators are guilty of a misdemeanor.

NEW YORK

Statutory authority is granted under the New York State Navigation Law, Section 33-c. Specific standards are set out in Section 75-3.1. In essence, the only devices which are currently practical and economical for shipboard use are holding tanks. But the State is continually reviewing devices which may satisfy their standards and periodically will publish lists of approved marine toilet control devices. Responsibility for both enforcement and surveillance is now with the New York State Department of Environmental Conservation.

OHIO

Ohio law requires that boats containing toilets and operating on Lake Erie, after July 1, 1973, must provide sewage disposal facilities approved by the Ohio Environmental Protection Agency. As of this time, holding tanks only have been approved.

PENNSYLVANIA

No specific regulations.

WISCONSIN

Chapter H80 of the Wisconsin Administrative Code, effective November 1, 1970, requires that all wastes from boat toilets must either be held for onshore disposal or treated in approved chemical or incinerator type toilets. Rules are also established for onshore disposal facilities.

The Department of Natural Resources Conservation Wardens are responsible for surveillance and enforcement of the boat toilet statute.

ONTARIO

In Ontario, since 1966, there has been a regulation prohibiting the discharge of polluting wastes from pleasure boats. Another Ontario regulation which became effective in August 1970 requires that marinas and yacht clubs provide or arrange pump-out service for a customer who has a pleasure boat with a toilet aboard. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats. Pumped out sewage is disposed of in a variety of ways, including: municipal sewage works; septic tank system; onshore storage tank.

In 1970, the year in which the pump-out requirements became effective, 142 marinas provided marine pump-out service. By 1971, this service was being provided at 224 marinas and yacht clubs in the Ontario portion of the Great Lakes basin. There are now about 250 pump-out stations in operation in the drainage basin.

While no specific legislative provision is made for control of domestic wastes from wash basins, laundries, showers, galley sinks, etc., wastewaters from these sources continue to give cause for concern. In considering the problems that would be involved with design and installation of equipment to handle these larger volume wastes, provision should be made to control these sources of wastes, especially those contributed by large commercial vessels.

The Ontario Operations Centre has also responded to contingencies arising from shipping accidents in Lake Huron and the St. Clair River; notable have been losses of oil which have fouled the beaches of Lake Huron and the downstream waters and shore properties of the St. Clair system. There have been reports of accumulation of grease and oil in beach sands as well as accumulation along the shores of sea-cock filler used by shipping companies in winterizing vessels.

Because provision of shore-based receiving facilities for commercial vessels in a limited number of harbors will require unique arrangements, the Ministry has proposed to the Canada Ministry of Transport a joint federal-provincial assessment of the problem with the municipalities involved and look forward to the successful conclusion of these arrangements.

Monitoring and Surveillance

The number of Canadian craft licensed at Great Lakes ports is estimated at 278,000. In 1969, powerboats registered in the North-East-Central United States amounted to 1,411,000. If 35% of these craft ply the lakes, they would have a population in excess of 771,000 licensed craft. Including the unlicensed craft, possibly over 1,000,000 pleasure craft are operating on the lakes.

Boats operating in Ontario waters are subject to routine inspection by the Ministry of the Environment which employs five inspectors. Of the 2,759 pleasure boats inspected during 1972, 64% were owned by Ontario residents and the remainder were from out-of-province. Violations were noted on 101 craft bearing Ontario identification and 140 visiting boats.

In 1972, increased emphasis was placed on the inspection of marinas to document the methods of disposal of garbage and sewage. Inspections are made annually of commercial vessels at winter lay-up ports to ensure satisfactory disposal of sea-cock filler and possibly other pollutants.

IV - SECTION E - POLLUTION FROM SHIPPING ACTIVITIES

SUBSECTION 3 - STUDIES OF POLLUTION FROM SHIPPING SOURCES

CANADA

As set out in the Agreement, the United States Coast Guard and Canadian Ministry of Transport are to coordinate studies of pollution problems in relation to shipping activities for the purpose of strengthening programs and other measures for abatement and control of pollution in accordance with Article V, Paragraph 1, Sub-Paragraph (e) (iii) and Annex 5. Initially studies are to include navigational equipment, traffic routes for navigational purposes, traffic control, manning of vessels, aids to navigation systems, waste water, sewage treatment systems for vessels, and loading or unloading of grain and ore.

Status

1. Navigational Equipment

   The following are examples of some recent and proposed regulations under Part XX of the Canada Shipping Act which are concerned with navigational equipment.

   (1) The Charts and Publications Regulations which require all ships to carry, maintain and use specific charts and publications have been in force since October 1, 1972.

   (2) The proposed amended Navigating Appliances Regulations which are due to come into force very soon will require certain ships to be fitted with navigational equipment, hitherto not required. These proposed amended regulations will also require the ship to maintain the equipment in an operating condition, and in addition, to be supplied with recommended spare parts.

   (3) A code of Navigating Practices and Procedures has been compiled and published and must be carried on board all ships in Canadian waters and fishing zones and on all Canadian ships in other waters as a requirement of the Charts and Publications Regulations. This Code sets out recommended standards of good seamanship and watch-keeping to be followed by the mariner as well as the testing and use of navigational equipment in both normal

and ice conditions. This Code will be reviewed after a trial period before further consultations are undertaken with interested parties prior to its becoming a regulation.

(4) Tests are being carried out with a transponder beacon which, if successful, will be given field tests in 1973. This consists of a Racon Beacon which will be triggered by a VHF transmission on 156.8MHz; a few selected ships will be fitted with this beacon, the purpose of which is to give positive identification of the transmitting vessel on the radar displays of other vessels' PPI. When the reports from selected ships have been evaluated, it should be possible to come to a decision on the feasibility of fitting all VHF equipped vessels with a transponder beacon which will give this positive identification to a vessel receiving the call on a designated frequency. This should enhance navigation safety.

2. Traffic Routes for Navigational Purposes

A start has been made on a review of the Great Lakes system of separate courses, on a lake by lake basis. This review is in its initial stages. Prior to further work being done in this line, it is desirable to make an evaluation of the existing Great Lakes separate courses and the system of routes introduced by the Ministry of Transport in the Gulf of St. Lawrence. This evaluation involves the use of a questionnaire that has been given wide distribution on the Eastern seaboard to as many ships as possible over the last few months. It is still too early to draw from this questionnaire positive conclusions, but it is considered that it will be possible to review the informal Great Lakes system of separate courses based upon the opinion of the persons whose opinion is valued the most, the "users". The use of the word "informal" when referring to the Great Lakes separate courses may not be entirely correct as the Ministry of Transport has issued a Notice to Mariners, No. 664 (weekly No. 28), which in a sense formally recognizes these courses and recommends that they be followed whenever possible. A limited, very informal discussion has been held with the United States Coast Guard in Cleveland, who expressed a degree of reluctance to tamper with the Great Lakes separate courses. However, this should not hinder MOT from carrying out a joint study of existing courses with the purpose of reviewing them for their adequacy and effectiveness.

3. Traffic Control

An extensive and sophisticated marine traffic control system is conducted by the St. Lawrence Seaway Authority from Montreal to Port Colborne.

4. Manning of Vessels

(1) Review of the entire Canadian certificate structure is presently underway and work will progress thereafter to a review of training and examination requirements.

(2) Standards of foreign certificates have been reviewed in connection with the Arctic Shipping Pollution Prevention Regulations and the proposed Ship's Deck Watch Regulations. The review has not attempted to compare these foreign certificate standards with Canadian or U.S. standards but with the minimal requirements set out in schedules C and D of the Arctic Regulations. These regulations both contain provisions which call for a certificated officer in charge of the bridge watch at all times. International shipping circles have protested vehemently that this is not possible with the shortage of officers prevailing at the present time.

(3) Under the warrant system envisaged in the Arctic and Ship's Deck Watch Regulations, it would be possible to determine, from the number issued, shortages of certificated officers in Canadian and other flag vessels.

(4) Regulations have been prepared by the Pilotage Branch, Ministry of Transport, and will shortly be submitted for approval by the Governor in Council. They prescribe the minimum qualifications, respecting navigational certificates, experience at sea, age and health of an applicant, that an applicant shall meet before he is issued a licence or pilotage certificate.

In the Great Lakes area an applicant must be the holder of a Certificate of Competency not lower than First Mate Inland

Waters. After the 31st of March, 1976, the applicant must be the holder of a Radar Observer's Certificate, must have attended a radar simulator course within the preceding 3 years and must be the holder of a restricted Radio-telephone Operator's Certificate. Within the 5 years preceding application for a licence or a pilotage certificate the applicant must have had sea service on board vessels employed on voyages that require a general knowledge of the area in which the applicant intends to pilot, must have served as Master for a period of not less than 12 months or as Deck Watch Officer for a period of not less than 24 months and must have held the appropriate Certificate of Competency for the capacity in which he served.

These are the minimum qualifications referred to in Section 42 of the Pilotage Act. The Great Lakes Pilotage Authority is preparing regulations under Section 14 of the Act establishing compulsory pilotage areas, classes of ships subject to compulsory pilotage and the circumstances under which compulsory pilotage may be waived, and may prescribe additional qualifications for the issuing of licences and pilotage certificates.

Both the Ministry and the Pilotage Authority are bound by a Memorandum of Arrangements between the Secretary of Transportation of the United States of America and the Minister of Transport of Canada. This memorandum is reviewed from time to time.

(5) Review of manning provisions as a whole is still underway and tugs will also be considered according to the nature of their tasks and the manning necessary to carry them out. This will form part of a general attempt to relate vessel tasks and technology with manning.

(6) The requirement for a qualified ice navigator appears in the Arctic Shipping Pollution Prevention Regulations. This is seen as the only additional manning requirement necessary in those waters and might be made applicable to operations in ice within

the Great Lakes as experience is gained with the Arctic Regulations.

5. Aids to Navigation Systems

(1) Visual aids - The system of visual aids is extensive and it is up-to-date. This process of up-dating is assisted by industry through their associations. Each year government officials meet with the Dominion Marine Association and the Lake Carriers Association to discuss conditions of navigation. These associations provide constructive suggestions which augment MOT's reviews. While visual aids are the most prominent in these studies, the audio and radio aids also come under review. This combined industry and government review helps assure that industry requirements are met.

(2) Radio aids - Only radio beacons are provided but these are numerous and located so as to best serve the traffic. These beacons are operated throughout the navigation season. In recent years requests have been received from U.S. interests to keep some island stations, especially the radio beacon, operating. These requests concerned islands in Lake Superior and up to now these stations have had to be shut down when the station crew is removed. A small battery operated light is left operating until the batteries are exhausted.

In the future these island stations will, along with all other light stations, be automated and it is anticipated that operation during winter will be possible as the need arises. The only limitation placed on this operation by winter is the difficulty of landing a service technician on the station in case of failure.

(3) General - Various proposals for marking narrow channels by systems which will provide the precision which buoys provide have been examined. Practical systems for general navigation have not been found. Accurate survey systems which provide this degree of precision exist but their application to general use is limited. The search continues for a practical substi-

tute for channel buoys when ice conditions preclude their use. Several manufacturers have been invited to submit proposals for an adequate method of navigating in these narrow waters but to date no response has been obtained.

6. Waste Water

A Ministry of Transport study has already been undertaken on this subject and has revealed that there is a serious lack of shore reception facilities at Canadian ports in the Great Lakes, under the concept of shore disposal. Copies of this study will be made available if necessary.

7. Sewage Treatment Systems

A detailed study of this subject has been carried out by the Ministry of Transport in preparation for the 1973 Marine Pollution Conference. Canada was lead country for this study, which involved collaboration with the United States, the United Kingdom, Sweden, and the USSR and the Federal Republic of Germany. The study was presented to the IMCO Sub-Committee on Marine Pollution in June 1972, and will be of assistance in the development of compatible regulations regarding treatment of vessel sewage.

8. Loading and Unloading of Grain and Ore

In conjunction with the study on waste water, some preliminary work has been undertaken regarding the loading of grain and ore at Canadian ports, including those on the Great Lakes. This study indicated that most major loading ports have adequate facilities to minimize marine pollution arising from loading operations. A further study will be needed, directed specifically at Great Lakes ports.

UNITED STATES

1. Navigational Equipment

Coast Guard views navigational equipment studies as being developed through position papers submitted through IMCO channels. Coast Guard is looking towards performance standards for both ship-board and shore based equipment. Coast Guard views application nationwide. Evaluation of navigational equipment being demonstrated in the Extension of Season Project will be coordinated through the Corps of Engineers, as the U.S. lead agency. While all involved U.S. agencies have an interest in study efforts regarding navigational equipment as the results affect their programs, direct participation by Maritime Administration, St. Lawrence Seaway Development Corporation, and the Coast Guard in any joint studies was desirable.

2. Traffic Routing for Navigational Purposes

Elements affecting this topic developed through the Extension of the Season project will be coordinated by the U.S. Corps of Engineers as U.S. lead agency. Aside from the Corps of Engineers, the most affected U.S. agencies include the St. Lawrence Seaway Development Corporation and the Coast Guard.

3. Traffic Control

In addition to the Season Extension Project of the Corps of Engineers, the Maritime Administration, St. Lawrence Seaway Development Corporation and the Coast Guard appear to be most directly involved.

4. Manning of Vessels

The recently completed DOT Draft Staff Report on Great Lakes Pilotage, presently under review, was identified as a study effort. In addition to the Season Extension Project considerations, the Maritime Administration (especially with reference to the domestic lake fleet and U.S. flag carriers), the St. Lawrence Seaway Development Corporation and the Coast Guard are most directly involved.

5. Aids to Navigation Systems

Elements of new systems are being evaluated under the leadership of the Corps of Engineers in the Extension of the Season Project. St. Lawrence Seaway Development Corporation and the Coast Guard have primary interest in any other initiatives undertaken under this topic.

6. Waste Water

The U.S. lead agency for the review of problems arising from the discharges of waste water and recommendations for reducing the deleterious effects of such discharge is the Environmental Protection Agency. While all interested agencies should be kept aware of study efforts, the Coast Guard, as the U.S. maritime law enforcement agent, appears to have more direct interest than other agencies.

7. Sewage Treatment Systems for Vessels

While the review of current research and development of systems for the treatment of vessel sewage appeared to be under the responsibilities of EPA, the recent amendments of 1972 (PL 92-500) have enlarged the role of the Coast Guard in this review area. Since the required review report to Congress must be on a national basis, the Great Lakes area will be included in the review. Direct interested agencies appear to be EPA, MARAD and the Coast Guard.

8. Loading and Unloading of Grain

No U.S. agency reported any on-going efforts to identify pollution problems arising from these operations.

SUBSECTION 4 - COORDINATED SURVEILLANCE AND ENFORCEMENT

CANADA AND UNITED STATES

The Ministry of Transport and the Coast Guard have agreed to develop a plan for a coordinated system of surveillance and enforcement of regulations dealing with the abatement and control of pollution from shipping activities.

At the joint meeting held 11-12 January 1973, it was agreed that the coordinated plan would be initiated by Commander, Ninth Coast Guard District and the Ministry of Transport Regional Director, Central Region. The plan will be developed with due regard to resource availability of other agencies, both Canadian and U.S., as well as those of the Ministry of Transport and the Coast Guard.

IV - SECTION F - POLLUTION FROM DREDGING ACTIVITIES

UNITED STATES

U.S. EPA activities with respect to dredging operations consist of the following:

(1) Inspection of proposed "polluted" dredge spoil disposal sites, to see that selection has a minimum adverse effect on the environment.

(2) Coordinating dredging operations with the Bureau of Sport Fisheries and Wildlife Services, and with the various States and local governments.

(3) A classification is made of dredged spoil as "polluted" or "unpolluted", based upon established criteria.

(4) Determination of the status of eligibility for waiving the cost requirement in programs for contained dredged disposal as outlined in Section 123 of P.L. 91-611.

(5) The dredging program in general is used by U.S. EPA to remove polluted bottom sediments from harbors and navigable waterways of the Great Lakes Basin. Those sediments which may cause a degradation of water quality if deposited by means of open-lake dumping, are contained in diked or on-shore facilities.

(6) The U.S. Army Corps of Engineers have the responsibility for issuing permits for the discharge of dredged or fill material into navigable waters at specified disposal sites as per Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The disposal sites will be specified by the Corps of Engineers through the application of guidelines developed by EPA, in conjunction with the Corps. EPA, in consultation and cooperation with the Corps of Engineers, may prohibit, withdraw, and deny or restrict the use of any defined area if there is an unacceptable adverse effect on the environment.

Many municipalities have difficulty in meeting the requirements for waiver of the 25% non-federal contribution of the cost of constructing polluted dredge spoil disposal facilities. These requirements are partic-

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pation in and in compliance with a regional and/or metropolitan plan and meeting applicable water quality standards.

NIAGARA RIVER

The most polluted materials dredged from the Niagara River area are those from the Buffalo River and the Black Rock Channel. These have been deposited within diked areas during recent years. A larger diked disposal area is being designed which will be located adjacent to the shore and outside of the wall at the south end of Buffalo Harbor. It is intended to deposit all polluted dredgings from the Buffalo vicinity into this area.

GENESEE RIVER

The Rochester embayment is used by the Corps of Engineers for annual disposal of dredging spoil from the lower Genesee River and Rochester Harbor. The Corps has proposed several upland disposal sites but has been faced with the reluctance of local authorities to take positive action.

HARBORS OF REFUGE

Lake Ontario

For Wilson, Olcott and Oak Orchard Harbors, the Corps of Engineers has been requested to dispose of future inner harbor dredging spoil at a suitable upland site. Unpolluted spoil taken from the harbor mouth area between the piers will continue to be disposed of in Lake Ontario.

ILLINOIS

Illinois Senate in October 1967 approved a bill prohibiting the deposition of any material in Lake Michigan without the joint permission of the Pollution Control Agency and the Department of Public Works and Buildings. To date, the only permits issued involve nonpolluting material such as steel pilings, concrete structures or clean sand.

INDIANA

The Indiana Harbor Ship Canal is routinely dredged by the Corps of Engineers. Much of the material dredged is residue from pollutants and thus constitutes a pollutant in itself.

In 1969, disposal of these materials by dumping in Lake Michigan was discontinued and all dredgings since that time have been placed behind the Inland Steel Company bulkhead-and-fill operation. Since construction has been completed on enclosure of this fill area, another disposal site will have to be secured for future dredging operations.

Most dredging in the harbor and canal is by clamshell, and this method releases some pollutants to the immediate area. This affects water quality in the canal during the dredging operation. Consideration must be given to improved dredging methods for future operations.

MICHIGAN

Active programs are in effect for the proper deposition of dredge spoil. The goal is to reduce pollutional inputs to the point where there are no polluted dredgings and in some cases no need to dredge by removing settleable solids at the source. There is a coordinated State effort in conjunction with U.S. EPA and the Corps of Engineers to minimize the environmental impact of the dredging program.

MINNESOTA

Under the provisions of the Federal Water Quality Act of 1970, any dredging project which requires a permit from the U.S. Army Corps of Engineers must be reviewed for certification by the State.

The Section of Industrial and Other Wastes reviews the application for certification to determine:

(1) if adequate information has been submitted,
(2) adequacy of detailed sketch maps,
(3) adequate operational program, and
(4) whether spoils from dredging are deposited in an area where surface runoff will not carry the material back into the stream or lake.

NEW YORK

See U.S. Federal Section.

OHIO

See U.S. Federal Section.

PENNSYLVANIA

See U.S. Federal Section.

WISCONSIN

Under the provision of the Federal Water Quality Act of 1970, any dredging project which requires a permit from the U.S. Army Corps of Engineers must be certified by the state. Spoils from dredging operations must be deposited in an area where surface runoff will not carry the material back into the stream or lake.

ONTARIO

Since 1969 the Ontario Ministry of the Environment (then the OWRC) has been reviewing and exercising control over the disposal of dredged spoils in Ontario waters of the Great Lakes and Connecting Channels.

Guidelines have been established which outline notification procedures, project design, scheduling and construction techniques for dredging and disposal, and sediment quality criteria. Where an area to be dredged is determined to be polluted; i.e. outside the criteria, contained disposal either on land or in a diked area is required. Cooperation is maintained with other government agencies responsible for the protection of the fisheries and in the event of land disposal, for land management and protection of air quality.

In 1972, the Ministry of the Environment examined some ninety proposals for maintenance and other dredging in the Great Lakes and tributary waters. In addition to requiring on-land disposal, the Ministry ensured that, in many cases of maintenance dredging in harbor areas, projects involving dredging in areas where recreational use was critical during the summer months would be scheduled for the spring or autumn seasons.

IV - SECTION G - POLLUTION FROM ONSHORE AND OFFSHORE FACILITIES

CANADA

The federal government has initiated a program to encourage contingency planning activities at a regional, provincial and local level, thus improving response capabilities to environmental emergencies. The government is developing a Research Intelligence program and maintains an on-going Technological Development and Training Program to develop and evaluate equipment, materials, techniques and prevention measures related to spills from onshore and offshore facilities.

Spills of oil or other hazardous materials from onshore and offshore facilities are generally dealt with under the Province of Ontario Contingency Plan. The Joint Canada-U.S. Contingency Plan deals with spills from commercial shipping and massive spills from onshore and offshore facilities where the pollutant threatens to cross the International boundary. Regulations dealing with discharges from such facilities are generally dealt with within existing Provincial or Federal regulatory programs.

UNITED STATES

Programs and measures for the abatement and control of pollution from onshore and offshore facilities for the prevention of discharges of oil and hazardous polluting substances are being addressed in a dual manner. Initially conceived and implemented in 1972 as a special condition of the Permit Program administered by the Corps of Engineers under provision of Section 13 of the River and Harbour Act of 1899, the requirement for specified onshore and offshore facilities to prepare a Spill Prevention Containment and Countermeasure Plan (SPCC) is now a part of the Permit Program under Section 402, "National Pollutant Discharge Elimination System", of the FWPCA Amendments 1972. The SPCC Plan applies to oil and a comprehensive listing of industrial raw materials and products. The Permit Program is now being administered by the EPA Regional Administrators but eventually the States will take over the Program.

At the present time, this is the only active U.S. program which addresses these programs and measures. The statute authority of Section 311 provides for a federally administered program for the prevention, abatement and control of oil and hazardous substance discharges. This will be accomplished through the issuance of regulations for oil pollution prevention and for hazardous substances pollution prevention. The U.S. Coast Guard has issued in the Federal Register on December 21, 1972 oil pollution prevention regulations for vessels and oil transfer facilities. It is anticipated that EPA's parallel regulations for non-transportation related onshore and offshore facilities will be promulgated in April 1973. The proposed regulations employ the SPCC concept and thus are complementary to the Permit Program Special Condition. The issuance of the prevention regulations for hazardous substances must await the promulgation of regulations incident to the designation of hazardous substances. It is likely that the prevention regulations for hazardous substances will also employ the SPCC Plan concept.

Programs relating to regulations for the identification and placarding of containers and vehicles is a DOT responsibility. Regulations are in existence for oil and a variety of hazardous materials (defined for purposes other than polluting the aquatic environment) to which both Canada and U.S. subscribe. The regulations for identification and placarding of containers and vehicles carrying hazardous polluting substances would be developed subsequent to the issuance of the regulation designating hazardous polluting substances.

In summary, the U.S. has an active program for abatement and control of pollution from onshore and offshore facilities for the prevention of discharges of oil and hazardous polluting substances under Section 402 of the current law. A more comprehensive program and one of universal applicability is in the process of development and implementation as directed by Section 311 of the current law.

ILLINOIS

No program.

INDIANA

Information regarding this section is contained in IV.F. and IV.H.

MICHIGAN

Discharges from on-or-off-shore facilities which may be injurious to the waters of the state are prohibited by provisions of the Water Resources Commission Act, Act 245, Public Acts of 1929, as amended. In addition, the Commission adopted "Rules for Spillage of Oil and Other Pollutants" which requires:

(1) booms to be available during on-or-off-shore loading of oil or other potentially polluting materials to prevent movement of any accidental spills;

(2) facilities which store or handle such materials shall have emergency containment equipment on site;

(3) adequate surveillance to detect spillage of such materials;

(4) adequate permanent diking or retention structures for storage facilities to contain leaks or spills;

(5) covers or enclosures to prevent runoff, seepage or leakage of such solid materials when stored; no storage closer than 50 feet from a watercourse;

(6) each facility to file a pollution incident prevention plan within 180 days of adoption of rules;

(7) each facility to file pollution incident reports.

It has been a long-standing policy of Michigan not to allow oil or gas wells in the Michigan waters of the Great Lakes or their connecting channels.

MINNESOTA

Minnesota requires notification of all spills of oil and pollutional materials to the Pollution Control Agency. Regulation WPC-4 requires secondary containment for stored liquids. A revised state spill contingency plan is currently being prepared.

NEW YORK

New York State has the necessary flexibility within its program through which rules and regulations are currently being developed covering transport, storage and transfer of oil; also covered by such rules, under a separate but similar program, are other hazardous materials. New York is developing approved methods of handling and confinement to prevent releases to the environment; the objective being prevention of spills rather than cleanup after the fact.

OHIO

No specific program.

PENNSYLVANIA

Pennsylvania established a Pollution Incident Prevention Plan (PIPP) program in 1968. All applicants for a waste discharge permit are required to submit a PIPP with their application. In addition, high risk industries are required to submit a PIPP on notice. The plan consists of structural features to prevent or contain spillages as well as training of personnel. Several large insurance companies reportedly have reduced liability rates for industries with an approved PIPP.

WISCONSIN

No specific program.

ONTARIO

The Province of Ontario Contingency Plan is intended to deal with spills of oil and other hazardous materials arising out of the production, processing, storage, transportation and distribution of such materials. Discussions are currently being held with transportation authorities and industry groups to deal with pollution arising from road and rail transport accidents. Regulation of waste discharges from commercial shipping is largely a federal jurisdiction although, in the case of oil spills from vessels in inshore regions, provincial agencies may direct corrective action through the Ontario Contingency Plan.

Pollution from offshore gas well drilling in Lake Erie has been investigated in the past and, generally, has not been found to be a problem. Inspection and monitoring of process waste controls is carried out by the Ontario Ministry of Natural Resources, Petroleum Resources Section, in cooperation with the Ontario Ministry of the Environment. Handling and disposal procedures for sanitary wastes are regulated by the Sanitary Engineering section of the Ontario Ministry of the Environment on an individual basis.

IV - SECTION H - CONTINGENCY PLAN

CANADA

The Joint Canada-United States Marine Pollution Contingency Plan for the Great Lakes has been rewritten by a joint working group to reflect the experiences which have accrued in the eighteen months the plan has been extant. The requirements of the Canada-U.S. Great Lakes Water Quality Agreement have been adhered to during the amending process.

A plan embracing all the waters of mutual concern adjacent to the boundary between the two countries has been prepared; one annex to this plan covers the Great Lakes, and additional annexes relate to the Atlantic and Pacific coasts. The original Great Lakes Joint Contingency Plan was used as the model in preparing this new planning structure. The new plan has been designed for easy additions and amendments.

The modified plan is now in the final stages of national approval in both Canada and the U.S. It will replace the original Joint Contingency Plan for the Great Lakes. The Canadian government has purchased significant quantities of the contingency equipment which has been deployed around the Great Lakes in support of the plan.

UNITED STATES

General Program

1. States may draw revolving funds from Congress for effecting Contingency Plans.
2. EPA furnished a representative for each Response Team.
3. EPA's authority to control dumping hazardous pollutants is under P.L. 92-500, Federal Water Pollution Control Act of 1972 Amendments. Penalties will be given as unit penalties based upon toxicity, dispersivity, and solubility of the material in the receiving water. Abatement units have been built under the U.S. EPA Research Grant Program for removing hazardous pollutants.

EPA has effected an on-going federally oriented contingency plan to abate pollution from petroleum products under the 1970 Water Quality Act.

Joint Ministry of Transport and Coast Guard responsibilities for maintenance of the Joint Contingency Plan were reaffirmed. The current plan for the Great Lakes is soon to be made part of an overall Joint U.S. - Canadian Contingency Plan at which time the Great Lakes portion of the overall plan will be made effective.

ILLINOIS

No specific plan.

INDIANA

The State Contingency Plan for controlling spills of oil and hazardous materials provides for a notification, response, and action plan. In addition, the State follows the Chicago Coastal Region Multi-Agency Oil and Hazardous Materials Pollution Contingency Plan published by the U.S. Coast Guard and cooperates with the Coast Guard, Environmental Protection Agency and other agencies having jurisdiction.

MICHIGAN

Michigan's contingency plan conforms to the requirements of the Joint United States-Canada plan for the Great Lakes region.

MINNESOTA

The State of Minnesota is in the process of redesigning its contingency plan. The new plan is expected to be in operation by the end of FY 1973. It will focus on these four main areas:

1. an alert system and emergency procedure for notification, abatement, and clean-up;
2. implementation of containment, control and clean-up measures;
3. assessment of environmental damage; and
4. water quality management plans for restoration of river basin.

NEW YORK

New York State has prepared an excellent Oil Contingency Plan which awaits official approval. Agreements have been in existence for quite some time between the State, EPA, Coast Guard and Canadian agencies that led to a rather effective communications network, which has functioned well in numerous spill situations.

OHIO

See U.S. Section.

PENNSYLVANIA

No specific plan.

WISCONSIN

In 1971, the Department developed a contingency plan and alert system and held training sessions to prepare for handling uncontrolled spills of oil and hazardous substances which cause environmental damage.

The purpose of the plan is to establish positive action programs for notification, control, containment and clean-up of spilled materials to minimize health hazards and deleterious effects on the environment. The plan emphasizes participation by industry and various units of government, in a coordinated response system. The plan relies upon the leadership of DNR On-Scene Commanders and Response Teams in all parts of the state with the abilities to alert and coordinate the resources of manpower, equipment and materials to control, contain, and clean up spills. On-Scene Commanders and their alternates were chosen and attended DNR sponsored training schools in 1971 and 1972.

Chapter 215, Laws of 1971, increased the Division of Environmental Protection appropriation by $50,000 in FY 1972-73 for the acquisition of oil spill containment equipment and supplies needed for this program. Equipment has been ordered for each of the District response teams.

ONTARIO

The interim Province of Ontario Contingency Plan for spills of oil and other hazardous materials was published in May 1971. The Ontario Contingency Plan, in its final form, will be published during the spring of

1973. The interim plan outlines a mechanism for the following actions:

(1) the discovery and reporting of spills,

(2) investigation of the report to confirm the spill and to determine its magnitude,

(3) coordinating the resources to contain and clean up the spill,

(4) establishing financial liability for the cost of clean-up operations.

Under the plan, Regional Operations Teams (ROTs) are to be formed and these ROTs are responsible for actually carrying out the actions outlined above. It is expected that all of the ROTs will have been established by the end of 1972.

The Ontario Contingency Plan has been designed to be compatible with and to complement other contingency plans; i.e., municipal, cooperative, federal and international plans. As such the Ontario plan is very flexible and can be changed in detail to account for changing requirements. In this regard, more emphasis may be placed on contingency planning at the municipal level in the future.

IV - SECTION I - HAZARDOUS POLLUTING SUBSTANCES

CANADA

Studies and other programs referred to in sections IV.E.2., IV.G., and IV.H., will provide technical input to the consultations required by Article 5 Section I of the Agreement.

UNITED STATES

Work is continuing to develop U.S. regulations concerning the identification of hazardous substances as directed by Section 311 of the Federal Water Pollution Control Act Amendments of 1972. Promulgation of these regulations is anticipated in October 1973.

The identification of harmful quantities of hazardous substances is also a requirement specified in Section 311 of the aforementioned Act. Promulgation of U.S. regulations to accomplish this is anticipated in November 1973.

With regard to reviewing the U.S. existent definition of harmful quantity of oil, a number of EPA research programs are in progress relative to the fate and effects of oil in the aquatic environment. The primary purpose of these research endeavours is to gain a more definitive knowledge of the harmful effects of types of petroleum products, and quantities thereof, on different kinds of receiving waters.

See also Sections IV.G., and IV.H.

ILLINOIS

No specific data.

INDIANA

Information regarding programs dealing with these substances is contained in other sections.

MICHIGAN

In 1970, Michigan enacted legislation requiring the filing of annual reports by all industrial and commercial establishments using or discharging certain "critical" materials as determined by a board of experts representing the various interests in the state. Such a list was established in 1971 and the first annual reports filed in January 1972. Michigan now maintains an inventory of use and discharge of 63 materials considered potential hazards to the water resources of the state. Control of these substances is accomplished through the provisions of Act 245, Public Acts of 1929, as amended.

MINNESOTA

Minnesota Pollution Control Agency Regulation WPC 4 requires specific safeguards for storage of oil and other liquid substances capable of polluting the state's waters.

A permit is issued only if adequate construction and sufficient storage volume are provided so that, in the event that a storage tank ruptures, all materials will be safely contained and prevented from entering surface or underground waters.

No inventory of materials has been made to date; however, it is anticipated that this may be done under the NPDES Permit System.

NEW YORK

New York State has a hazardous chemical control program which was legislated and now is in effect. The purpose of the program is to control storage, transport, and use of hazardous chemicals to the extent of substantial curtailment or elimination of the potentiality of pollution from such chemicals.

OHIO

Hazardous polluting substances are treated as an industrial waste.

PENNSYLVANIA

See IV. G. In addition, spills of polluting or hazardous materials must be reported to the department.

WISCONSIN

Included as part of Section IV.H.

ONTARIO

Investigations into the environmental effects of a wide variety of industrial chemicals are now proceeding. These will aid in the definition of hazardous polluting substances.

Reports have recently been published on the toxicity and other effects of chemicals used in the mining industry and as raw materials in chemical specialties. Investigations are now proceeding into chemicals used in the pulp and paper industry.

Those chemicals that are persistent, subject to biomagnification and pose a potential health hazard to man and/or pose a significant threat to the survival of wildlife, are of most concern at present and these could perhaps form the basis of a definitive list of hazardous polluting substances.

Chapter V

OTHER ACTIVITIES UNDER THE AGREEMENT

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V - SECTION A - THE UPPER LAKES REFERENCE

The Great Lakes Water Quality Board issued Directive Number 1 to the Upper Lakes Reference Group at the October 1972 meeting of the Board and submitted suggestions to IJC on membership. The Reference Group has met four times. A more detailed status report and Plan of Study are the subjects of a separate report.

V - SECTION B - THE LAND DRAINAGE REFERENCE

The Great Lakes Water Quality Board issued Directive Number 1 to the Land Drainage Reference Group at the October 1972 meeting of the Board and submitted suggestions to IJC on membership. The Reference Group has met three times. A more detailed summary of activities is the subject of a separate report.

V - SECTION C - LIAISON WITH RESEARCH ADVISORY BOARD

The Great Lakes Water Quality Board maintains liaison with the Great Lakes Research Advisory Board by sending the co-chairmen as observers to Research Advisory Board meetings. In like manner, the co-chairmen of the Research Advisory Board attend Water Quality Board meetings. The Water Quality Board has referred two subjects to the Research Advisory Board for their recommendations on research. These are PCB's and Viruses in the Great Lakes.

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